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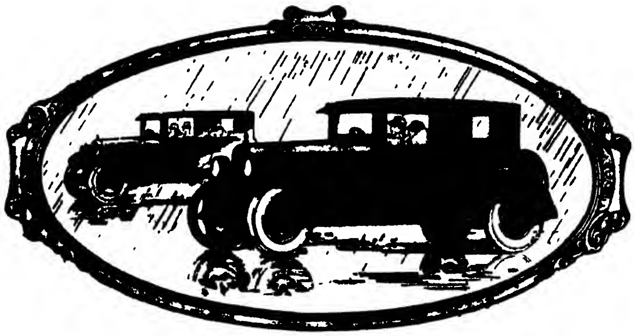

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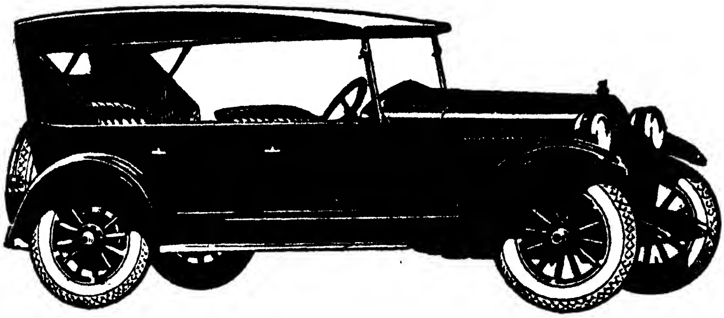

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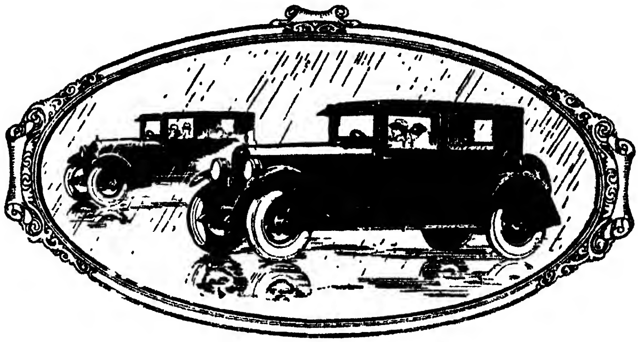

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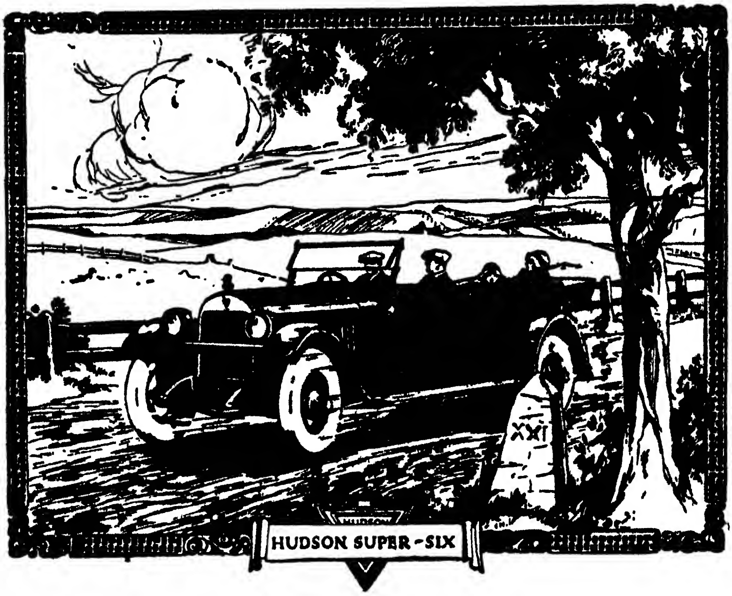
HUDSON SUPER-SIX

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Crop-growing Competitions, 1925.

INTRODUCTION.

A. H. E. McDONALD, H.D.A., Chief Inspector of Agriculture.

THE wheat-growing competitions conducted during the past wheat season have been easily the most important and interesting in the history of the movement in this State. The interest has lain very largely in what (in view of the adversities of the season) must be considered the extraordinary yields obtained. These are so notable as to mark clearly the great advances which have been made in wheat-growing methods during recent years. It is recognised by all with experience of wheat-growing that had the methods and varieties of a few years ago been adopted this season, growers would have had only poor yields, whereas many of the competition crops have given heavy yields, and on the whole the wheat harvest of the State will be a very fair one.

No one factor can be regarded as responsible for this result. Good seed of suitable varieties, proper seed treatment, improved methods of cultivation, timely sowing, and the application of fertilisers have each contributed something towards an improvement in the yield of grain.

To the wheat farmer the season has been one of alternating hopes and fears. In December, 1924, and January, 1925, extremely heavy rains fell in all districts, and although they were not welcomed on account of the serious interference with harvesting which they occasioned, the rains were of considerable value, as the subsoil was thoroughly saturated. The ground subsequently became very hard and difficult to prepare for seeding, but the moisture stored in the subsoil considerably helped the crops of the season now closing. This was particularly the case in the north-west, where some very good yields have been obtained with only three to four inches of rain on the growing crops.

It is noticeable this year that in many cases crops sown on early ploughed, well prepared stubble compared very favourably with crops on long-fallowed land. There is no doubt this was due to the heavy summer rains referred to. Where the stubble land was ploughed early a great deal of the moisture was conserved, and in effect the main object of fallowing—conservation of moisture—was obtained. The good crops obtained on such stubble land, therefore, rather than being unfavourable to fallowing, are an indication of its value; but it must be remembered that rains such as those of last summer are entirely abnormal, and if these results from stubble land are allowed to determine future practice, disappointment will surely follow. However, farmers now know the value of fallowing so well that there is little danger of this.

During the autumn practically no rain fell, and much land became very hard, and farmers had difficulty in making preparations for sowing. The dry spell broke in May in the western and southern districts (though it

continued dry in the northern parts), and heavy rain fell almost continuously during June and part of July, further retarding sowing. Generally, however, the position was very satisfactory in July, and with a normal spring an excellent harvest was anticipated, notwithstanding that the acreage had been slightly reduced owing to farmers not being able to sow all the land they intended.

In the spring the weather again became abnormally dry and continued so until the end of October. In addition, the winter months were extremely cold and growth was retarded. The one saving feature was that cool, bright weather prevailed during the later stages of the development of the crop and little moisture was required. The grain filled out well in all districts, while in parts of the west and in some of the later districts timely rains before the crops had ripened materially assisted.

While it is gratifying to note that even under these adverse conditions the general improvement in farm practice has led to a fair average yield being obtained, the outstanding feature of the crop competitions is the evidence they afford of the excellent yields that may be secured by close attention to all the points of the business. Yields ranging from 20 to 30 bushels have been common, and many crops have given well over 30 bushels. The methods by which such satisfactory returns have been obtained are set out in detail in the reports of the judges. They are methods which have been adopted by practical farmers who are out to make farming pay, and they can be confidently recommended for general adoption.

WEST WYALONG.

E. S. CLAYTON, H.D.A., Agricultural Instructor.

THE present season has been rather adverse. The weather was too dry during April—in fact, practically no rain was recorded during that month. During the winter too much heavy rain was received, which packed the soil down too tightly. In many instances the crops were flooded by the heavy rain. During the months of August, September, and October hardly any rain was received.

RAINFALL (where available).

	April.	May.	June.	July.	August.	Sept.	Oct.	Total.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
S. E. Ford	0	364	221	151	120	68	55	979
Moncrieff Bros. ...	0	340	311	155	70	69	68	1,013
A. Leslie	0	350	238	194	127	69	24	1,002
W. F. Flohr	0	344	275	120	40	0	53	832
D. and J. Gagie ...	0	342	294	145	98	64	62	1,005
E. T. Clark ...	12	272	285	138	84	28	35	854
H. W. Staniforth ...	0	321	191	106	113	37	39	807
R. M. and C. L. Gelling	0	322	266	171	107	55	43	964

That so many excellent crops were inspected in spite of the unfavourable season speaks volumes for the cultivation methods adopted by many of the West Wyalong farmers.

Of the sixteen entries eight were Waratah, which has proved to be particularly suitable to this district, and is now one of the most popular varieties.

Mr. H. W. Staniforth won the combined fallow and crop competition with a particularly fine crop of Waratah. In the fallow section of the competition Mr. Staniforth's fallow occupied second place. His excellent crop is almost entirely due to good work put into the fallow. In fact, throughout the competition it was noticeable that those fallows which were considered to be in good condition at the time when the fallows were judged produced the best crops, except where other outside influences (such as

Judging Messrs. Moncrieff Bros.' Crop at Wyalong.

flooding, &c.) had interfered. Unfortunately some good fallows on the heavier soils were flooded by the heavy winter rains. This was the case in Messrs. D. and J. Gagie's fallow.

Mr. Staniforth's fallow had been ploughed in July with a mouldboard plough 4 inches deep, springtoothed to the full ploughing depth in August, using fine points on the cultivator. It was springtoothed again in October to a depth of only 2 inches, again in January and February, and again prior to drilling (all shallow cultivations). The fallow was closely grazed with sheep throughout. At the time of judging the fallow it was in excellent condition as regards moisture and consolidation.

It is significant that the fallow which produced this winning crop had been worked along the lines recommended by the Department—in fact, most of the leading crops throughout this competition had been worked along similar lines.

The crop was sown on 14th May, putting on 80 lb. of graded seed and 100 lb. of superphosphate per acre. The seed had been treated by the dry copper carbonate process. This excellent crop, produced in an adverse

season, proves the value of heavy seeding and manuring, even in dry seasons when the fallow has been worked along the right lines. It demonstrates that the old-time fear of heavy seeding and manuring is groundless, provided, of course, that the fallow is in good condition. The growing crop had also been harrowed in August with heavy harrows. In a season such as this, when the land is packed by heavy winter rains, harrowing the growing crop is particularly advantageous. It is a practice that can be recommended.

Mr. Staniforth's good crop was the direct result of careful fallowing, the application of a heavy seeding and manuring, and the choice of a variety so eminently suited to the district as Waratah.

If the majority of farmers in the district could be persuaded to adopt the same cultivation methods as the leading competitors in this combined competition, their average yields would undoubtedly be increased.

Mr. Staniforth's Winning Crop at Buddigower.

Diseases.

Flag smut was again very noticeable throughout the district. The growing of oats, clean fallowing, and the use of oaten chaff for feeding the horses is recommended for the control of this disease. If horses are fed on chaff made from wheaten hay infected with flag smut they will reinfect the land with this disease. As farmers cut the headlands and divisions for hay, they should, in view of the seriousness of this disease, consider the advisability of always sowing oats in their headlands and divisions. An early-maturing variety, such as Mulga or Quandong, is admirable for this purpose, as it ripens early and can be cut, cured, and carted away long before the wheat crop is ready to harvest.

Except in isolated instances, no foot-rot or take-all was noticed. As a whole the crops were very healthy. The dry copper carbonate treatment had been adopted by almost every competitor, and with excellent results as regards better germination and early growth, and effective prevention of stinking smut.

Results of 100-acre Combined Fallow and Crop-growing Competition.

Name.	Variety.	Date sown.	Quantity of Seed.	Quantity of Superphosphate.	Type.	Freedom from Disease.	Evenness.	Condition.	Freedom from Weeds.	Yield.	Total.	Points scored in Fallow Competition.	Grand total.
Maximum points	....	......	...	...	20	30	20	10	*	†	...	150	...
			lb.	lb.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
H. W. Staniforth, Buddigower	Waratah	14th May ...	80	100	19	25	19	9	28	27	127	130	257
S. E. Ford, "Brentwood," Wyalong... ...	Waratah	6th May ...	75	90	19	25	18	9	28	27	126	127	253
D. and J. Gagie, "Spy Hill," W. Wyalong ...	Union and Bena ...	Early May	60	60	19	24	18	9	25	23	118	134	252
B. Davies, W. Wyalong	Turvey	Mid April ...	60	65	18	25	18	9	25	26	121	96	217
A. Leslie, Tallimba	Federation ...	End April ...	60	60	18	26	15	7	24	14	104	112	216

Results of 50-acre Crop-growing Competition.

Name.	Variety.	Date sown.	Quantity of Seed.	Quantity of Superphosphate.	Type.	Freedom from Disease.	Evenness.	Condition.	Freedom from Weeds.	Yield.	Total.	Points scored in Fallow Competition.	Grand total.
C. L. Gelling, Tallimba	Waratah	9th May ...	55	78	19	27	18	9	23	27	123	...	...
D. and J. Gagie, "Spy Hill," W. Wyalong ...	Federation ...	May ...	60	60	19	26	19	9	23	26	122	...	...
Staniforth and Rees, Buddigower	Canberra	Mid April ...	80	75	16	24	18	9	23	31	121	...	...
E. L. Haub, "Milga," W. Wyalong	Waratah	Early May	55	60	17	26	16	9	25	25	118	...	...
Moncrieff Bros., Wyalong	Canberra, Waratah and Federation.	Mid May ...	60	80 H. Grde.	17	24	17	9	24	26	117	...	...
R. M. Gelling, Tallimba	Waratah	9th May ...	55	78	19	27	15	7	23	25	116	...	...
S. Edgerton, Blow Clear	Federation and Waratah.	End May ...	60	70	16	24	17	8	25	26	116	...	...
W. Cooper, "Fortuna," Wyalong	Waratah	Mid April ...	48	45	17	25	17	8	22	24	113	...	...
E. T. Clark, "Pine Glen," Caleen	Canberra	End April ...	60	56	17	25	17	7	24	22	112	...	...
W. Flohr, Euratha	Gresley	20th April...	52	65	12	27	15	8	27	21	110	...	...
J. R. Scealy, "April Hill," W. Wyalong ...	Wannon	Mid April ...	50	60	19	23	15	7	25	20	109	...	...

* First crop, 24 points maximum; second crop, 25 points; third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points, sixth crop, 29 points; over six crops, 30 points.
† One point for each bushel of estimated yield.

In connection with this competition the West Wyalong Agricultural Society organised a very successful field demonstration on Messrs. D. and J. Gagie's farm. A large number of interested farmers assembled, and the objects and lessons of the combined fallow and crop-growing competition were explained and discussed with every evidence of interest in the subject and of profit to all present.

General Comments.

A combined fallow and crop competition, by drawing attention to the methods adopted by leading farmers, has a good effect on the whole district. Most competitors are now using liberal applications of superphosphate and fairly heavy seedings, and in almost every instance the seed was treated with dry copper carbonate. The question of varieties is also receiving some publicity and it is very significant that most of the good crops in the district under review were Waratah, Federation and Canberra, or varieties very similar.

There is great room for improvement in the methods of cultivation, and it is in this direction that we must look for any great increase in average yields. It would be hard to devise a better system of cultivation than that adopted by Mr. Staniforth. It was exceptionally sound, even to the harrowing of the crop in August. The only modification that could be suggested would be that the first ploughing should be in June instead of July, or better still (especially if the land were dirty with wild oats) to scarify after burning the stubble in February or March, and then plough in June or July. At present too many farmers are only too willing to take the line of least resistance and are afraid of overworking their soil. There is no doubt whatever that more loss is occasioned from not working the fallow enough than from overworking it. Providing judgment is used in choosing the implement and in selecting the time for the operation there is no danger of overworking the soils in this district.

PARKES AND ADJACENT COMPETITIONS.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

When local crop competitions were first promoted, full reports of each contest, giving details of how each crop was produced and general comment on the farm practice followed by each competitor, proved interesting and instructive, but to-day, when almost every centre has its competition, and when the general principles underlying high crop production are fairly widely known, the call for such detailed information is not so great. The present report, therefore, is of a more general nature, embracing matters of interest to all the centres concerned, though referring particularly to the competitions conducted at Parkes, Forbes, Trundle, Peak Hill, Bogan Gate and Coradgery.*

* Owing to extreme demands upon our pages, it is only possible to give the full awards for one competition in the district. That method has had to be adopted in connection with the adjudications of instructors in other districts.—Ed.

Each year nature has something new to teach, and in this western district, where the seasonal conditions vary somewhat from year to year, we need to be wide awake to continue the progress towards that 20 bushel per acre average which is our first objective. In our enthusiasm the danger of becoming opportunists as a result of endeavouring to fit our farm practice to the teachings of the past year alone is rather real, whereas the only road to success is a compromise between the teachings of the past decade. Forgetting the isolated instances of stubble-sown crops equalling the yields of certain crops on fallowed land, and also the fact that in places untreated seed has given bunt-free wheat, we must look for the methods which give the greatest average yield—not those that alone excel in a dry year, nor those especially suited to a wet year.

The present season's competitions, if closely studied, contain a wealth of information. The season finished under extremely dry conditions, and the "old hands" are absolutely confident that under similar climatic conditions ten years ago most crops would have failed. This is a great tribute to the better farming movement, which has the crop competitions as its centre.

The Season.

Summed up, the season was tricky. It favoured the thorough, systematic man with a full plant who is always ahead of his job, but it was difficult for the man who was handicapped during the sowing month of May.

The rainfall during the fallow period was greatly in excess of the average, and during the summer months (November, 1924, to February, 1925) abnormal, 1,615 points being registered at Parkes, which is the highest for that period for more than thirty-five years. The summer rains delayed harvesting, and consequently many fallows were neglected, and, March to April proving dry, any caked surface lost heavily in moisture, and thus became difficult to bring into condition for sowing.

Adequate seeding rains fell in May, though frequent light falls delayed sowing somewhat, and the farmers who did not finish seeding by the middle of June met with trouble owing to heavy rains during the third week of that month. These rains waterlogged portions of paddocks and set the surface, and wheat that was not above ground had difficulty in getting through. In some cases the wheat swelled and burst, leaving blank patches in otherwise excellent crops.

July was dull and showery, and growth rather slow. The months of September and October, following August with only 110 points of rain, were the driest since 1896, and doubts were entertained as to whether the crops would fill. A fall of 66 points on 30th October helped the late crops, but was of little use to the earlier and heavier crops. However, with the aid of the fallow, suitable varieties, pure seed, and superphosphate, crops filled remarkably well, and a harvest better than the average is confidently expected.

RAINFALL Table.

Month.	Parkes.	Forbes.	Trundle.	Bogan Gate.	Coradgery.
Fallow period, June, 1924, to April, 1925.					
1924.	Pts.	Pts.	Pts.	Pts.	Pts.
June	243	167	195	206	215
July	229	218	164	173	222
August	193	216	178	188	174
September	426	398	292	294	385
October	133	149	133	143	122
November	446	311	446	535	642
December	170	114	191	258	134
1925.					
January	442	187	252	241	291
February	557	312	265	223	379
March	97	133	120	130	104
April	27	35	10	32	32
Total	2,963	2,240	2,246	2,423	2,700
Growing period, May to October, 1925.					
May	192	222	256	245	219
June	650	167	503	573	576
July	169		117	146	163
August	110		117	165	92
September	44		36	11	26
October	94		57	73	22
Total	1,259		1,086	1,213	1,098
Grand total ...	4,222		3,332	3,636	3,798

Superphosphate.

Parkes.—Every competitor in the Parkes competition applied superphosphate to his crop, the average amount working out at 68 lb. per acre. In 1924 the average amount was 54 lb. per acre, which shows an increase of 14 lb. per acre.

Trundle.—All the fourteen entries in the Trundle competition had been aided by superphosphate at the average rate of 51 lb. per acre, an increase of 1 lb. over the quantity applied in 1924.

Bogan Gate.—The eighteen entries in the Bogan Gate competition had been manured with superphosphate at the average rate of 52 lb. per acre.

Forbes.—All the fourteen entries in the Forbes competition had been manured with superphosphate at the average rate of 54 lb. per acre, an increase of ½ lb. above that used in 1924.

Peak Hill.—Of eighteen entries in the Peak Hill competition fifteen had been manured at an average rate of 47 lb. superphosphate per acre, three crops being unmanured.

Coradgery.—All the six entries in the Coradgery competition were manured with superphosphate at the average rate of 52 lb. per acre, an increase of 10 lb. over the quantity used in 1924.

The general tendency is to increase the amount of superphosphate applied per acre, and this may be safely encouraged, provided fallows are well worked. A safe minimum appears to be 60 lb. over the whole of this portion of the western district, which amount can wisely be increased in certain centres. Even this exceptionally dry spring has proved manured crops to yield higher than unmanured ones.

Seeding.

The average amount of seed applied per acre in the different centres is as under:—

	1924. lb.	1925. lb.
Parkes	52	56
Trundle	49½	49
Bogan Gate	...	56
Forbes	59	58
Peak Hill	.	49
Coradgery	51	57

It is evident that heavier seedings are now being made than in former years, and the most frequent reply to the query, "amount of seed per acre?" is "one bushel of graded copper carbonate treated seed." Roughly, this is probably equal to 70 lb. of ungraded bluestoned seed, so the increase above the old standard of 45 lb. per acre is rather remarkable. The increase is partly possible because of better fallows and the use of superphosphate, but is more largely due to the growing of the quicker maturing, lower stooling varieties of wheat.

Time to Sow.

Sowings are best completed before the month of June. The June sowings are only spoiling what might be a good fallow for the following year's crop. Sometimes a "magpie" may be scored, but never a "bull's eye." It seems that a nine-bag crop must have time to stool and attain a decent, respectable height by the third week in September, which is not possible with late sowings.

Seed Treatment.

The treatment of the seed for bunt prevention is indicated by the following table:—

Competition.	No treatment	Dry treatment.	Wet treatment.
Parkes	1	9	2
Trundle	1	9	4
Bogan Gate	...	11	7
Forbes	1	11	3
Peak Hill	2	14	2
Coradgery	...	6	...

The dry copper carbonate powder was used in 77 per cent. of the cases where seed treatment was applied, while in 1924 the proportion was 44 per cent. Is the dry process efficient? When the many dusting contrivances and machines and the various grades of powder that were sold are considered, the results secured leave no room for doubt. It was rare, indeed,

to find bunt. Last year much of the seed was damaged, sprung, and even shot, and had bluestone been used poor germinations would have taken the place of very satisfactory ones.

The Varieties Used.

The following table shows the varieties and the number of crops of each variety exhibited at each centre:—

Variety	Parkes	Forbes	Trundle	Bogan Gate	Peak Hill.	Coradgery.	Total
Canberra	8	6	4	11	6	2	37
Waratah	2	5	2	...	4	...	13
Clarendon	1	...	1	...	...	1	3
Gresley	2	1	3	5	3	3	17
Turvey	1	1	...	...	2	1	5
Sultan	1	...	...	...	...	...	1
Yandilla King ...	...	...	1	...	...	...	1
Gluyas Early ...	...	..	3	...	...	...	3
College Purple Straw...	...	1	2	...	...	...	3
Warden	...	...	1	...	...	...	1
Federation	...	...	1	...	1	...	2
Hard Federation ...	...	2	1	...	...	...	3
Quality	...	...	..	1	...	...	1
Bald Knob	...	...	...	1	...	...	1
Florence	...	1	...	1	...	...	2
Billy Hughes ...	...	...	...	1	...	...	1
Firbank	...	1	...	...	1	...	2
Cowra No. 1	...	...	...	...	1	...	1

The proportion of Canberra crops exhibited during the past two years is:—1924, 28 per cent.; 1925, 38 per cent.; while that for Waratah is 3·5 per cent. and 13·4 per cent., respectively. The number of varieties was 24·7 per hundred crops in 1924, and 18·5 per hundred crops in 1925. The proportion of mid-season varieties exhibited in 1924 was 29·4 per hundred crops, and in 1925 13·4 per hundred crops.

The placing of the varieties in the six competitions was as under:—

	Firsts	Seconds.	Thirds.
Canberra	5	3	4
Yandilla King	1	...	...
Gresley	...	1	2
Waratah	...	1	1
Clarendon	...	1	1
Turvey	...	...	1

The number of varieties placed third exceed six owing to more than one variety being exhibited in two of the entries.

Last year attention was drawn to the large number of varieties grown, and the suggestion was made that the number could profitably be reduced and more attention paid to the sowing of high quality seed of the better yielding sorts.

PARKES Crop Competition.

Crop Position.	Competitor.	Type and Purity.	Disease Freedom.	Evenness.	Condition.	Cleanliness.	Estimated Yield.	Total.	Variety.	Date Sown.	Seed (lb. per Acre).	Superphosphate (lb. per Acre).	Seed Treatment.	No. of Previous Crops.	Cultivation Details.
	Maximum Points.	20	30	20	10	†	*								
		Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.							
1	E. J. Johnson, "Iona" ...	19	27	19	9	26	35	135	Canberra	May 14...	50	60	Copp. Carb.	‡	Ploughed June, 1924; worked five times; Combine sown.
2	J. R. Postlethwaite, "Kellor."	19	28	17	9	29	32	134	Canberra	June 8 ...	60	56	Copp. Carb.	‡	Ploughed July, 1924; worked six times; Combine sown.
3	H. Stone, "Nottingham"	18	29	19	8	23	32	130	Canberra, Waratah, Clarendon.	May 2 ...	52	53	Copp. Carb.	1*	Ploughed August, 1924; worked once; Combine sown.
4	W. W. Watson, "Woodbine."	19	24	17	9	30	27	126	Canberra	May 23	65	110	Copp. Carb.	‡	Ploughed June, 1924; worked five times; Combine sown.
5	G. F. Mill, "Hazlemere"	18	28	17	9	27	26	125	Gresley	June 4 ...	50	50	Copp. Carb.	20	Ploughed July, 1924; worked five times; drill sown.
6	H. K. Nock, "Nelungaloo"	18	27	16	8	28	25	122	Canberra, Sultan...	June 10	60	56	Copp. Carb.	‡	Ploughed June, 1924; worked three times; Combine sown.
6	J. Aitken, "Hanonvale"	18	25	19	10	28	22	122	Canberra	April 10	70	100	Bluestone	‡	Ploughed August, 1924; worked three times; Combine sown.
8	R. M. Kelly, "Winocara"	18	24	18	10	28	20	118	Waratah	June 3 ...	60	104	Copp. Carb.	‡	Ploughed July, 1924; worked nine times; Combine sown.
9	E. J. Johnson, "Iona" ...	19	26	17	9	28	16	115	Canberra	June 14	60	80	Copp. Carb.	‡	Ploughed July, 1924; worked eight times; Combine sown.
10	R. Scriviner, "Hildavale"	17	27	15	6	27	20	112	Turvey	May 15...	40	45	Copp. Carb.	‡	Ploughed August, 1924; worked four times; drill sown.
11	B. C. Adams, "Sunnyside"	18	22	11	10	18	28	107	Canberra	May 1 ...	56	56	Not treated	2	Stubble sown crop; ploughed April, 1924; worked once; drill sown.
12	H. S. Cousins, "Brooklyn"	19	14	14	7	20	23	97	Gresley	May 5 ...	52	53	Wet treatment...	‡	Ploughed July, 1924; worked twice; drill sown.

† First crop, 24 points maximum; second crop, 25 points; third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points.

* One point for each bushel of estimated yield.

‡ Old paddocks, more than six crops.

This year there was a reduction of 25 per cent. in the number of varieties exhibited, and the type and purity of the crops have considerably improved. The demand for pure seed has considerably increased, and such demand is being well catered for by the pure-seed growers.

The past season has been a triumph for the early maturing wheats, especially Canberra. Waratah was well to the fore in the Forbes competition, no doubt because of its success with Mr. H. E. Elliott last year. This year it has fully maintained its reputation in field trials, and can confidently be recommended for sowing on larger areas.

Gresley is a variety that has become fairly popular. It apparently escapes flag smut infection in rather a marked degree, only traces of the disease being noted. As a grain yielder it is not equal to Canberra, but it is a better hay wheat.

The slower maturing wheats are still decreasing in favour, and it is possible that within a few years they will be entirely eliminated from this portion of the western district. Such a change could not have been looked upon with favour a few years ago, but with the advent of the early maturing, good yielding, and vigorous growing wheats, such as Canberra, Waratah, and Gresley, the change is perhaps justified.

Cultural Methods.

In the table below the ploughing of the fallow and the drilling of the seed have not been included in the number of times the fallows were worked, but where the combined drill was used it has been counted as a working.

Competition	Crops on Fallow.		Crops on Stubble.		Average number of times Fallow worked		1925 Crops sown with—	
	1924	1925	1924	1925	1924	1925	Combine.	Drill.
Parkes	23	11	1	1	3·9	5·4	8	4
Trundle	17	13	5	1	3·	3·7	6	8
Forbes	17	14	1	1	3·8	4·	8	7
Coradgery	11	6	nil	nil	3·5	2·7	5	1
Peak Hill	...	12	...	6	...	2·7	8	10
Bogan Gate	...	15	...	3	...	3·	10	8
Totals	68	71	7	12	...	...	45	38

The above table illustrates what an important factor is fallow in producing high-yielding crops. It also shows that the fallows are receiving more attention as to workings in certain centres, and when the difficulties of last harvest, which prevented attention being given to fallows, are considered, the work is even more creditable than appears by the figures.

Working of the Fallows.

The unusual climatic conditions during the past eighteen months have presented doubts to some minds as to the wisdom of frequently working fallows. During August isolated crops that were sown on well-worked

fallow were inferior to those sown on rough, unworked fallow. In places good fallow was so charged with moisture that the heavy June rains water-logged portions of the paddock; finely-worked land caked, became cold, and growth and stooling were slow, but it is the finish of the crops which tells, and well-worked fallow is still on top.

Some good stubble-sown crops were seen, but the burning of the stubble in February and the working of the land immediately following the heavy summer rains, conserving these as we do the winter rains, really produced a fallow as far as moisture-content was concerned.

Sowing Ex-fallow Land.

The partial success of ex-fallow sown crops this year might tend to weaken resolutions to sow only on fallow land. The contention is that such crops are cheaply produced, and that a seven-bag crop so grown is as profitable as a nine-bag crop grown on fallow.

So it might be, but the difficulty is to be sure of the seven-bag crop! A moderate year following a wet year might give the result, but it is the year when fallowed land gives 15 bushels and ex-fallow land hardly returns seed which needs consideration. And then there is the problem of oats, weeds, diseases, and fodder crops to think of, in addition to the throwing of a systematic cropping system out of gear. With large areas risks might be taken, but for the smaller man—stick to the fallow.

Diseases.

Crops were this year remarkably free from foot-rot and take-all. Perhaps such a result may be attributed to the season, and perhaps improved farming had something to do with it. Bunt was noticeable in only a few crops, and tribute must be paid to the effectiveness of the dry treatment of the seed. Loose smut was prevalent in some crops, but hardly sufficient to occasion much concern.

Flag smut is viewed with concern, especially as the most popular wheat, Canberra, shows marked susceptibility to it. Gresley seems to be able to escape marked infection, and Wandilla (a later wheat) even more so. The disease was almost absent from crops sown on new land, or where the land had been under fallow for two years. Only suggestions can at present be made for its control, and they are: Fallow well, rotate with oats, and where the disease is particularly bad sow Florence or Gresley wheats.

Pure Seed.

The demand for pure, high-quality seed is increasing, and it seems likely that all the supplies produced by the pure-seed growers will be readily sold. One grower is placing an order for 400 bags of wheat and 100 bags of oats, and many farmers are purchasing quantities of twenty to fifty bags of wheat. Local farmers will be well advised to place their orders early, as distant centres may be asking for supplies.

HILLSTON.

L. S. HARRISON, Senior Agricultural Instructor.

This district made its initial appearance among crop competitions this season, and is to be congratulated on the effort, which was an augury for greater enthusiasm in the future. The number of competitors judged reached the respectable total of thirteen, after a somewhat adverse spring for crop purposes.

There was no crop of particular or outstanding excellence throughout the competition, and the proximity of the points indicates the very small difference between the entries. At the same time, there is evidence of careful and well considered farming with the majority of entrants, though the winning crop secured points in a fortuitous way, largely owing to the fact that it was the fourth crop, all the previous ones having been failures, thus contributing toward the maximum for cleanliness, while affording assistance to the crop by means of what was, in effect, an unintentionally long fallow.

Attention must be drawn particularly to the fact that the longer maturing varieties, such as Yandilla King and Currawa, showed up well in the competition, and this may tend to influence others to continue the use of such varieties, though they are not climatically suitable to the Hillston district over a period of normal years. Somewhat earlier or quicker maturing varieties are more suitable, and their use is to be recommended; for example, Canberra and Waratah for the earlier varieties; and the little longer season Union, and then Federation.

A brief description of these four varieties may be interesting. Canberra is a wheat of fairly recent origin, and is a hybrid between Federation wheat and Volga barley, but it has been long enough in use now to have made its presence known among farmers on sheer performances. The straw, however, is a little weak.

Waratah is also a wheat of fairly late production, being a cross between Purple Straw and Gluyas. It is a good all-round wheat and is very fair in the straw.

Union, one of the newer varieties, is a cross between Federation and Cowra 15 (the latter a departmental crossbred of somewhat complicated breeding), and is an excellent grain wheat, standing up particularly well.

Federation is a cross between Purple Straw and Yandilla. Although at this stage of its career it does not require an introduction, it is interesting to recall is parentage.

Mr. Busch, who owned the second-prize crop (one of Waratah, which looked particularly well), has been carrying out experiments with the Department of Agriculture since 1922 on land very typical of the average Hillston wheat country, and it is interesting to note that in that year Waratah and Federation came first and second on yield; Union and Florence were first and second, with Waratah and Early Bird equal third in 1923, while Federation, Canberra, and Waratah filled the first three places in 1924.

These were all in competition with many other varieties sown under similar conditions, for the purpose of determining the most suitable variety for the locality.

The manurial trials over a like period give an indication that 56 lb. of superphosphate to the acre is the most desirable quantity; incidentally, 55 lb. of superphosphate to the acre was the average disclosed in the information supplied by each competitor as having been used by them throughout the blocks entered in the competition now under review.

It will be immediately recognised that if humus or organic matter could be added to this class of country, an advantage would result, but owing to the light rainfall, combined with the intense heat, decomposition of straw or stubble can only take place in a negligible degree. On the other hand, it is essential that the straw or stubble should be burnt off, as it affords a medium for fungus troubles, chiefly flag smut and take-all, which must be combated by every possible means. Reference has recently been made to the desirability of alternating a crop of oats occasionally, and the practice may be strongly urged as a valuable one. Burn the stubble, take off an oat crop, and then revert to a long fallow for wheat again. As flag smut was very prevalent around Hillston, attention might be again drawn to the serious effect the feeding of flag smutty chaff to horses can have on a previously clean paddock; on this account the feeding of oaten hay is particularly recommended.

Ball smut or bunt was not in serious quantities in the crops judged, although in a few places the trouble was apparent. The newer method of bunt control, in which dry copper carbonate dust is used, is proving its efficacy in no uncertain manner.

Loose smut was seen in far too great a quantity, and the only practical way of dealing with this trouble is to select seed from a paddock free from it. Reference has at times been made to a "hot water treatment," but this is out of the question for the farmer.

Detailed reference to the crops judged is unnecessary, since practically each one was discussed in the paddock at the time. Although the apparent yields may seem low, in the circumstances they are as satisfactory as could be anticipated with the absence of rains at the critical flowering period.

It is quite impossible properly to prepare a fallow in this district without the assistance of sheep, and since the fallow has unquestionably such an influence on the crop, it is of utmost importance that it be given that well considered attention that it deserves. It is being recognised that the fallow ploughing is best done with a mouldboard, subsequent cultivations being done with the harrow, springtooth, and rigid tine, with a disc cultivator when demanded for the control of paddy melon and black thistle. If these weeds are only in comparatively light growth on the paddock, they might be cut with a hoe.

Sheep should and can be used for practically all weed control, while the cultural implements should be reserved for soil condition—the harrow to break the crust immediately after a shower of rain, the springtooth cultivator to obtain a cloddy surface and fine soil beneath, and the rigid tine

to stir up the soil while maintaining the top condition and killing all ordinary rubbish that withstands the attack of sheep. It is almost always at the expense of soil condition when implements have to be resorted to to control weeds which should have been controlled by sheep.

It is interesting to note that wheat-growing has been going on at Hillston for approximately thirty years, and in 1924 the Government Statistician points out "that only once prior to 1916-17 did the average exceed 10 bushels. Since that year a remarkable improvement has taken place, although the average rainfall is little more than 9 inches in the growing period. Farmers to the south-east of Hillston have gathered crops in the past six years which have shown a greater yield per acre than those of the whole State, or even the Riverina, except in 1919-20."

The earlier and pioneer wheat-growers in the Hillston district transported their grain by road to Carrathool, a distance of approximately 70 miles. It would appear almost incredible that such a penalty could be supported by this industry, yet some of these men are to-day (with the rail now close at hand) among the most successful settlers in the district. Hillston is on the Lachlan River, almost due west from Sydney, a distance of 462 miles, and 403 feet above sea-level. The average annual rainfall is 14¼ inches, computed over a period of thirty-six years; the three months in which the average rainfall is heaviest, together with average fall therein, are: May, 142 points; June, 160; October, 137. Hence it will be recognised that with an efficient and definite system of fallowing, carried out judiciously with the assistance of sheep, the use of suitable well graded and pure type varieties, wheat-growing in this district holds prospects of a bright future, though on casual consideration some few years ago it was considered far too precarious a proposition.

Name	Variety	When Sown.	No. of Crops.	Yield.	Type.	Disease Freedom.	Evenness.	Condition.	Cultivation	Total.
Maximum Points.	...	...	...	*	20	30	20	10	†	
V. Chambers ...	Yandilla King ..	Early May.	Fourth crop ...	20	18	28	19	8	26	119
J. Busch	Waratah	Middle May	Old land ..	19	19	27	19	8	26	118
R. Peters ...	Currawa, 45 acres; Firbank, 5 acres.	End of April	New land ...	19	18	29	18	9	23	116
J. Hutchinson ...	Yandilla King ...	End of April	Third crop ..	20	18	27	19	8	24	116
H. Pittson ...	Federation, 28 acres; Currawa, 8 acres; Yandilla King, 14 acres.	End of April	Part, second; part third crop.	18	18	28	17	8	25	114
Varcoe Bros. ...	Firbank, 20 acres; Currawa, 30 acres.	Early May...	Part new ground, part second crop.	19	18	28	19	7	22	113
C. C. Green ...	Hard Federation ...	Middle May	Second crop ...	18	18	27	18	7	24	112
W. Cashmere ...	Federation ...	End of April	Third crop ...	16	17	28	18	8	25	112
J. G. Green (stubble).	Hard Federation ...	Middle April	Second crop ...	18	18	25	19	8	24	112
J. Maw	Hard Federation, 25 acres; Canberra, 25 acres.	Early May...	Second crop ...	17	18	27	17	8	24	111
J. Watson ...	Canberra	End of May	New land ...	17	19	25	19	7	23	110
J. G. Green (new ground).	Hard Federation ...	Middle April	New land ...	20	18	25	17	7	23	110
A. J. Hi[illegible] ...	Federation ...	Early May	New land ...	16	17	28	18	7	22	108

* Yield—Apparent yield, 1 point to every bushel estimated. †Cultivation—First crop 24 points, ranging to 30 points for over six crops. By "evenness" is meant uniformity of height, density and stooling; "condition" covers stage of maturity, excessive flag, lodging, or danger thereof, &c.

Further Observations on Root Development.

R. D. LEES, B.Sc. (Agr.), Farrer Research Scholar.

During the season of 1923 the effect of superphosphate on root development in wheat was investigated at Wagga Experiment Farm, and the results obtained were published in the *Agricultural Gazette* of September, 1924.

Investigations along similar lines were conducted during 1924 at the same farm, where the Manager and Experimentalist kindly made available manurial experiment plots. The plots utilised were — (*a*) Five plots of Zealand sown early, which had received dressings of (1) no manure, (2) ½ cwt., (3) 1 cwt., (4) 1½ cwt., (5) 2 cwt. superphosphate per acre respectively, and (*b*) five plots of Firbank, sown late, which had received similar dressings of superphosphate.

Investigations on Zealand were commenced sixty-five days after sowing, and the results obtained are given in Table I.

Table I.—Showing effect of Varying Quantities of Superphosphate on Root Development.

Variety, Zealand.

Days after Sowing.	Depth of Roots in Inches.					Days after Sowing.	Depth of Roots in Inches.				
	No Manure.	½ cwt.	1 cwt.	1½ cwt.	2 cwt.		No Manure.	½ cwt.	1 cwt.	1½ cwt.	2 cwt.
65	4½	15	16½	14½	13½	135	16½	27½	30½	28	27½
72	6½	16½	17½	15½	16	142	18	29½	32	30	30
79	7	19½	17½	17	17½	149	22	34½	37½	35½	35½
86	7½	20½	20½	18½	17½	156	26	40	41½	41½	41½
93	8½	21½	22½	19½	19½	163	30	44	47½	47½	46½
100	10½	23½	24½	21	21	170	36	47	51½	49½	49½
107	12	25	26½	22½	21½	177	40½	47½	53½	53½	52½
114	12½	26	26½	24	23½	184	41½	49½	55	54½	53½
121	14½	26	28½	25	26	192	43½	50	55½	54½	54
128	15	26½	29½	26½	27½						

The difference between the unmanured and manured plots in the depth of penetration of the roots is shown in the table. This difference continued until the final observation, when, though not so marked as at first, it was still significant. The table emphasises the depth to which wheat roots penetrate. The soil where these observations were made had a stiff gravelly clay subsoil, and the absence of such a subsoil would, no doubt, have allowed an even greater penetration than that shown in the table. The next table shows the results obtained from Firbank.

TABLE II.—Showing effect of Varying Quantities of Superphosphate on Root Development.

Variety, Firbank.

Days after Sowing.	Depth of Roots in Inches.					Days after Sowing.	Depth of Roots in Inches.				
	No Manure.	½ cwt.	1 cwt.	1½ cwt.	2 cwt.		No Manure.	½ cwt.	1 cwt.	1½ cwt.	2 cwt.
48	4	5	5	5½	4½	104	12½	22½	23½	23½	21½
55	5	7½	6½	7½	5½	111	14½	23½	24½	25½	24½
62	6½	10½	8½	8½	6½	118	16½	26	27½	28	25½
69	6½	12	11	10½	9	125	22½	33½	35½	35	32½
76	8½	13½	12½	13½	13½	132	30	40½	43½	40	37½
83	10	16½	17	16	15½	139	34½	44½	47½	46½	46½
90	9½	18½	18½	18½	17½	146	35½	46½	48	48½	47½
97	12½	21½	23½	21	20½						

Here, again, the stimulating influence of superphosphate is evident, though the differences are not so marked as in the case of Zealand, and the depth of penetration is not so great, no doubt owing to the shorter-growing season of Firbank. It is interesting to note, however, that in 146 days the roots of Firbank penetrated to a greater depth than did those of Zealand in 149 days, the former being a much earlier maturing variety.

From the above data it is obvious that plants derive a distinct gain from superphosphate by virtue of a better developed root system, due to the stimulating effect of this fertiliser. It is to this stimulated root development that the general effects of superphosphate, so noticeable in the growing crop, are largely due. As a consequence, when the best results are to be obtained from the use of superphosphate, there must be sufficient moisture in the soil and subsoil for the use of the roots and subsequently of the plants. The only way—other than natural means—to provide this moisture is by fallowing, so that the best results are only obtained when superphosphate is used in conjunction with fallowing. The roots are then able to penetrate deeply and quickly into the subsoil, and so to withstand dry conditions. It has been found that a good fallow will store in the first 3 ft. 9 in. of soil an amount of moisture, equivalent to about 4½ in. of rain, more than an unfallowed soil, and when superphosphate is used this amount of moisture will give the crop a very great advantage.

While the season of 1923 was by no means normal, that of 1924 was fairly typical of a good season at Wagga. Consequently a comparison of results obtained during the two seasons is of interest, and is presented in Table III.

TABLE III.—Showing comparison between Root Development of Zealand during 1923 and 1924 seasons, as affected by Superphosphate.

Depth of Roots in Inches.

Days after Sowing.	No Manure.		½ cwt.		1 cwt.		1½ cwt.		2 cwt.	
	1923.	1924.	1923.	1924.	1923.	1924.	1923.	1924.	1923.	1924.
107	10	12	13	25	17	26½	17	22½	18	21½
114	18½	12½	22½	26	28	26½	28	24	26	23½
121	22	14½	24	26	30	28½	30	25	27½	26
128	26½	15	28½	26½	31½	29½	30½	26½	30	27½
142	32	18	35	29½	37½	32	36	30	35	30
149	36	22	40	34½	42½	37½	39½	35½	39½	35½
156	40	26	45	40	47	41½	45	41½	40	41½
164	43	30	46½	44	49	47½	46	47½	43½	46½
171	43	36	46½	47	49	51½	46	49½	43½	49½

From this table it will be seen that, while in the early stages of growth the results obtained in 1923 were greater than in 1924, the later stages showed a reversal of this. The final results in 1923 were obtained 171 days after sowing, and in 1924 192 days after sowing. One feature noticeable is the spasmodic growth in 1923 compared with the more uniform growth of 1924. This was undoubtedly due to the seasonal differences, and it would appear that a good season results in a more uniform root development.

Conclusions.

In the light of the foregoing observations the results may be summarised :—

(1) Roots are enabled to penetrate deeply and quickly into the subsoil by the stimulating effect of superphosphate.

(2) The area of soil and subsoil from which the roots and subsequently the plants obtain plant-food and moisture is thereby increased.

(3) Fallowing is essential in order to obtain best results from superphosphate.

(4) The longer-growing season of an early-sown variety leads to greater root development than in the case of a late-sown variety, though the latter shows more rapid root development.

(5) Seasonal variations lead to variations in root development, the more uniform root development resulting from a good season.

(6) The observations show the great range in depth of roots and the depth to which moisture may be conserved.

A CO-OPERATIVE society is first and foremost a business organisation, and proper regard must be paid to business methods. Generally speaking, co-operative enterprise has been most successful where it has observed the ordinary business principles of its competitors.

Farmers' Experiment Plots.

WINTER GREEN FODDER EXPERIMENTS, 1925

Upper North Coast.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

THE following farmers co-operated in conducting winter green fodder trials during the past season:—

H. Johnson, Condong, Tweed River.
M. McAuliffe, Tregeagle, *via* Lismore.
C. Oliver, "Laurel Dale," Casino.
B. M. Hill, Highfield, Kyogle.
P. J. Landrigan, Karangi.
M. McBaron, "Riverview," Raleigh.

The continuous rains during the autumn rendered the planting of winter cereals somewhat difficult. Thorough preparation of the soil was impossible, the land being too wet to permit the necessary cultivation to bring the soil into good tilth. Planting in most cases was delayed until very late. Heavy rains after planting were also responsible for unsatisfactory conditions of growth.

The harvesting and weighing of plots was only carried out at Condong and Tregeagle. Although no weights were taken at the other centres, a considerable amount of green fodder was obtained by grazing the plots, and the farmers who did this were quite satisfied that the growing of winter green fodder, even under such adverse conditions, was a sound economic proposition.

The rainfall during the growing period at the two centres at which weights were taken was as follows:—

1925.	Condong. points.	Tregeagle. points.
May	135	49
June	1,008	394
July	86	76
August	359	810
September	......	4
Totals	1,588	1,329

The Plots.

Condong.—Soil, alluvial loam, early maize being the previous crop. The maize stalks were chopped up with a disc-harrow and ploughed in, after which the land was disc-harrowed and cross-harrowed. Planting was carried out immediately on 12th May, the seed being covered with the harrow. Myall and Lachlan oats showed a fair amount of rust, but Sunrise, Ruakura,

Mulga, and Algerian oats showed very little. Florence wheat was also showing a little rust, but the other varieties of wheat were free. Mulga oats showed signs of weakness of the straw and lodged slightly. Zealand wheat also lodged slightly, while Firbank lodged badly. The varieties Clarendon, Florence, and Firbank were harvested 28th August, and the remaining plots on 10th October.

Tregeagle.—Soil, red volcanic; previous crop, early maize. Land was ploughed early in March and again at the end of April, and harrowed before planting, which was carried out 13th May, the seed being harrowed in. Lachlan and Ruakura oats rusted badly, with the result that only poor yields were obtained from these two varieties. All other varieties rusted only very slightly. Harvesting was carried out on 19th September of all plots with the exception of Algerian, Guyra, Myall, Ruakura, and Lachlan oats and Zealand wheat, which were harvested on 2nd October.

YIELDS of Cereals and Cereal and Legume Mixtures.

Variety.	Condong	Tregeagle
	t. c. q.	t. c. q.
Florence wheat and Grey field peas	13 17 0	7 13 2
,, ,, Golden vetches	12 0 0	7 10 3
Clarendon wheat	14 2 3	8 7 1
Zealand ,, ...	13 5 3	7 16 1
Florence ,, ...	12 4 1	7 16 3
Gresley ,, ...	11 14 1	8 0 3
Firbank ,, ...	9 8 2	7 5 3
Ruakura oats	12 18 2	4 2 3
Sunrise ,, ...	12 5 3	7 13 2
Algerian ,, ...	12 4 1	10 15 3
Guyra ,, ...	....	8 1 2
Mulga ,, ...	12 2 3	....
Myall ,, ...	11 17 3	7 8 2
Lachlan ,, ...	5 6 1	4 11 2
Trabut barley	7 18 2	6 0 0
Cape ,, ...	8 10 0	5 0 0
Black Winter rye	....	8 1 2

FERTILISER Trials (with Florence Wheat).

Fertiliser per Acre.	Condong.	Tregeagle.
	t. c. q.	t. c. q.
Superphosphate at 140 lb.	9 4 1	7 0 0
,, ,, 280 lb.	11 7 1	7 0 0
*M7 at 182 lb.	13 2 3	6 19 1
*M5 at 210 lb.	10 0 0	8 7 3
*P7 at 126 lb.	13 14 1	7 3 2
No Manure	12 4 1	7 16 3

*The fertiliser mixtures were made up as follows:—M7 superphosphate 10 parts, chloride of potash 3 parts; M5, superphosphate 2 parts, sulphate of ammonia 1 part; P7, superphosphate and bone-dust n equal parts.

Comments.

It will be seen from the results obtained that Clarendon wheat has done exceedingly well in these trials. Clarendon is a very early variety, with fairly fine straw and an abundance of dark green flag. It is an excellent variety to grow where green fodder is required early in the se son. Sunrise oats have also done fairly well. They are a little later than Clarendon wheat. Algerian oats is a late variety, and provides excellent feed in the early spring.

By growing these three winter cereals—Clarendon wheat, Sunrise and Algerian oats—a continuous supply of green fodder can be maintained until the pastures nave become established in the spring, while the grasses are not eaten down heavily during early growth, but are given time to establish themselves much earlier in the season.

The growing of green fodder crops for feeding to dairy cattle during late winter and early spring maintains the cows in good condition, so that they commence to yield heavily as soon as the spring starts. Where cattle are allowed to lose condition during the winter, they have to build up their bodies and regain condition before they commence to yield well; thus a considerable period of high returns is lost to the dairy-farmer.

It is generally found that if Saccaline is fed during the late autumn and early winter, when the supply is exhausted in the spring the cattle do not readily take to the pastures (which are generally very shor), but stand around waiting to be fed, with the result, that they go off in yield and lose condition rapidly. It is then that winter green fodder is necessary to take the place of the Saccaline.

The planting of these cereals should be carried out in March, April, and May. The rate of seeding recommended is 2 bushels per acre for cereals broadcasted alone, and 1½ bushels when in combination with legumes. The legumes in such a combination should be sown at the rate of ½ bushel per acre.

A Lesson from Drought.

Water is the plant's greatest need. Yet, as a report of experiments carried out by the Tennessee College of Agriculture points out, it is not the lack of much moisture alone that makes the difference between a good and a poor harvest.

Two fields lying alongside were ploughed, planted, and cultivated alike. In one, drought burned the maize to death; in the other, the maize plants remained green, and even before late rain came the ears were continuing to increase in weight and feeding value.

This difference was due to a difference in the soil conditions of the two fields. In one case the land had been cropped long and continuously to maize, and the organic content was low. In the other field the soil had been cropped to legumes from time to time, and vegetation had been turned under frequently, so that there was sufficient organic matter to store up the moisture present when the weather turned dry.

Pedigrees of some Departmental Wheats and their Nomenclature.

J. T. PRIDHAM, H.D.A., Plant Breeder.

It is felt that there is a need for a list of the principal of the many wheats produced by this Department, for the information and guidance of wheat-breeders generally, not only in the Commonwealth, but also abroad.

If a New South Wales variety has proved itself disease-resistant or possessed of some quality making it valuable for crossing purposes, it is very desirable to know what parent (if a crossbred) is responsible for the character under notice. A comparison of pedigrees and characteristics of varieties will sometimes reveal a common parent or ancestor imparting the quality in question.

The following list by no means gives all the varieties produced—space is hardly available for this, nor is it necessary to publish particulars of material that has not been of value *per se*, or in combination with other wheats—but it is hoped it will be of use.

Aussie—(Federation x Gluyas).
Autumn Saumur—(Imported from France).
Bald Knob—(Red Skin x Yandilla).
Baldry—(Hard Federation x Cowra 19).
Bandon—(Selection from Yandilla King).
Baringa—(Yandilla King x Zaff x Bomen).
Barwang—(Natural crossbred from Hard Federation).
Bayah—(Improved Fife x LAT. x Jonathan).
Bena—(Hard Federation-Marshall's No. 3; natural crossbred).
Berthoud—(Zealand, which see).
Binya—(Selection from Hard Federation).
Blé carré de Sicile rouge—(Imported from France).
Blount's Lambrigg—(Selection from Blount's Hybrid : = 300).
Bobin—(Thew x Steinwedel).
Bobs—(Sport from Blount's Lambrigg x Nepaul barley).
Bomen—(Red Potocka x PFa. x PFa. x Jonathan x Zaff).
Boolaroo—(From Hard Federation x Clarendon).
Boonoo—(Steinwedel x Yandilla King x Zaff).
Bredbo—(Hard Federation-Marshall's No. 3; natural crossbred).
Bunyip—(Rymer x Maffra).
Cadia—(Cleveland x LAT. x Jumbuck x 9 (F)*).
Canberra—(Federation x Volga barley).
Canimbla—(Hard Federation x Cleveland).
Cargo—(Cleveland x LAT. x Gilgandra x 9 (F)).
Carinda—(Cleveland x LAT. x Gilgandra).

Cedar—(PFa. x PFa. x Jonathan x Zaff).
C(F)—(Sport from Blount's Lambrigg).
Clarendon—(Bobs x Gluyas x Jonathan x Eden x Jondhala).
Cleveland—(Levelhead x Purple Straw Tuscan).
Comara—(Cleveland x Gilgandra).
Comeback—(14 x Vanessa x Indian G.).
Coreen—(Cleveland x Rymer x Bunyip).
Cowra 15—(F7 x Emmer, &c. x Jon. x Jon. x Gunner x TB. x Jon. x 9 (F)).
Cowra 19—(Bald Knob, which see)
Cudgen—(Cleveland x Gilgandra).
Cumberland—(From Blount's Lambrigg x Pasteur).
Defiance—(Californian variety resembling Blount's Lambrigg).
Dragoon—(300 x 14 x 300).
Duri—(Hurst's 14 x Canberra).
Early Baart—(Imported from United States, America).
Early Bird—(Hurst's No. 4, which see).
Early Haynes' Blue Stem—(Selection from HB. Stem).
Early Lambrigg—(Sport from Blount's Lambrigg = M(F) = 300 (A)).
Eden—(14 x 193 x 14 x Hussar).
Emmer, &c.—(14 x 300 x White Emmer x Ward's White x 14).
Etawah—(A variety from India).
Federation—(Purple Straw x Yandilla).
Firbank—(Berthoud x Maffra).
Florence—(White Naples x 14 x White Naples x 14 x Eden).
Forelock—(Hurst's 14, which see).
French Early White—(Imported from France).
F(7)1—(A variety from India).
Genoa—(White Naples x 14 x White Naples x 14 x Eden).
Gilgandra—(14 x LAT. x LAT. x LAT. x Jonathan).
Glen Innes No. 2—Early HB Stem x HB Stem x HBS. x Zaff).
Glen Innes No. 3—(MBSa. x Jonathan x Warren).
Gluyas—(From South Australia; originally from Egypt).
Gunner—(14 x Roma).
Gurkha—(Yandilla King x Zaff).
Hard Federation—(Natural crossbred from Federation).
HBS.—(Haynes' Blue Stem; imported from United States, America).
Hornbill—(Florence x Huguenot).
Hornblende—(193; a white Fife from Prof. Blount, U.S.A.).
HEPS.—Hudson's Early Purple Straw; Australian selection).
Huguenot—(Natural crossbred from Medeah; from J. Correll, West Australia).
Hurst's Nos. 1 to 14—(Selections from Federation x Volga barley).
Hussar—(193 x Indian G.).
Improved Fife—(14; white grain; from United States, America).
Jacinth—(Of Purple Straw breeding).
Jade—(Jacinth x Early Baart).

John Brown—(193 x 14 x Longboat x LAT.)
Jonathan—(14 x Hussar x Indian G.).
Jondhala—(Small spherical grain from India).
Jumbuck—(14 x Tardent's Blue x LAT.).
King's Jubilee—(Purple Straw type).
Lazistan—(Selection from a Russian variety).
LAT.—(Lambrigg Australian Talavera; selection from Talavera).
Lazar—(193 x Lazistan).
Longboat—(Blé carré x Ward's White).
Maffra—(300 x 193 x King's Jubilee).
Marshall's No. 3—(Cross on Ward's Prolific by Mr. R. Marshall, South Australia).
M(F) = 300(A)—(Early Lambrigg).
MBSa.—(Minnesota Blue Stem, from United States, America).
Nonpareil—(A hay wheat from South Australia).
Nyngan Nos. 1 and 2—(Bobs x Gluyas x Jon x Eden x Jondhala).
Nyngan No. 3—(Bobs x Lazar x Gluyas).
Pasteur—(French Early White x 172 x Ward's White).
PFa.—Power's Fife, from United States, America).
Plover—(Trigger x Purple Straw).
Purple Straw—(Probably local selection from imported English variety).
Rattling Jack—(Selection from Purple Straw).
Red Potocka—(Imported from France).
Redskin—(Dragoon x Autumn Saumur x Autumn Saumur).
Rerraf—(Selection from Blount's Lambrigg).
Riverina—(Hurst's No. 8).
Roma—(King's Jubilee x Indian G.).
Rymer—(14 x Purple Straw).
Sicile rouge, blé carré de = 100—(Imported from France).
Silver King—(White straw strain of Marshall's No. 3).
Sinew—(Blé carré x 193).
Stamina—(Federation x Thew).
Statesman—(193 x 193 x Ward's White).
Steinwedel—(Selection from crop of Champlain, in South Australia).
Summer Club—(Probably from United States, America).
Sunrise—(193 x Summer Club).
Sunset—(Sport from Blount's Lambrigg x Sunrise).
Tardent's Blue—(Originally from the lower Danube, Europe).
Tarragon—(14 x Tardent's Blue).
Thew—(C(F) x Sinew x 14 x 14 x Hussar).
Trigger—(Purple Straw and Yeoman).
Union—(Federation x Cowra 15).
Volga barley—(A 2-row, awned, naked barley from Russia).
Vanessa—(193 x Indian A.).
Wandilla—(Federation x Yandilla King).
Waratah—(HEPS. x Gluyas).

Ward's White and Ward's Prolific—(Selections by Mr. Ward, Nelshaby, South Australia).

Warner—(Statesman x Hussar x Indian G.).

Warrah—(Warren x Florence x Huguenot x Nyngan No. 2).

Warren—(Warner x Bobs x Jonathan).

White Naples—(Resembles Zealand; imported from France).

Yandilla—(14 x Etawah).

Yeoman (Farrer's)—(193 x Ward's White).

Yandilla King—(Yandilla x Silver King) by Mr. R. Marshall, South Australia).

Zealand = Berthoud—(Imported from France by Mr. Berthoud, of West Australia).

Zaff—(A hard grain selection from Muzaffar nagar white wheat from India).

9(F)—(14 x LAT. x LAT. x Nonpareil x Maffra).

14—(Improved Fife (white grain), from United States, America).

100—(Blé carré de Sicile rouge).

122—(Jacinth).

172—(A Purple Straw type).

193—(Hornblende).

300—(Blount's Lambrigg).

Electro-culture Investigations at Rothamsted.

"The work carried out by the committee since 1918 has shown that under field experimental conditions an increased yield of 20 per cent. on the average may be expected when certain spring-sown cereals are subjected to high-tension electrical discharge, also that under both field and pot experiments electrification has accelerated reproductive growth much more markedly than vegetative growth."

The foregoing passage is taken from the Journal of the English Ministry of Agriculture, in reference to investigations at Rothamsted Experimental Station as disclosed by the Electro-culture Committee in its seventh interim report. "It is very noticeable," it is stated, "that in the electrified plants the increase in grain yield is relatively higher than that of total yield (straw plus grain). A relative decrease in total yield may even be associated with an increase in grain yield."

The experiments of the present year are again being confined to small scale work to deal with the following four questions:—

1. Whether the first or second month's electrification is more effective.
2. Whether the first and second or second and third month's electrification is more effective than electrification for a single month or for the whole season.
3. The daily duration of discharge.
4. The intensity of discharge.

Soil Fertility.

Its Maintenance and Improvement by Means of Rotation, Cover, and Green Manure Crops.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

The task of the pioneers of this country was associated with land rather than soil problems; they were primarily engaged, that is, in the search for such country as seemed richest and most fertile, that promised the greatest yields of foodstuffs, and the fertility of which was sufficient to maintain high production for many years. But the pioneering stage of land development has now mostly passed. The fertile lands have been heavily cropped, with a natural loss of those elements which characterise fertility, and less fertile lands, less able to withstand exhaustive cropping methods, have been taken up, so that the problem of the farmer is now not with the land but with the soil.

Except on alluvial land periodically improved in fertility by floodings (which are becoming less frequent owing to the hand of man being set against them where possible), the time comes to farmers in every country, sooner or later, when the maintenance or improvement of the soil fertility must be thought of if they are to continue to harvest good crops. That certain crops are of value in soil improvement was a fact known and exploited by even the ancient Romans. The following article is designed to assist farmers, by showing the role of different crops and cropping practices, particularly in the growing of rotation, cover crops, and green manuring crops.

The term cover crop is a loose one, but it generally refers either to a crop which is grown as a subsidiary crop, after or before a main crop, instead of allowing the land to lie fallow, with the object of either utilising it as a green manure crop or as a fodder crop or as a combination of the two—at any rate with the ultimate idea of improving the soil fertility for the main or any subsequent crop. In some cases the idea of protecting the soil from washing or being leached of its plant-food by heavy rains is paramount. This, of course, helps materially in maintaining or improving the fertility in seasons or districts of heavy rainfall. In other cases, as in the case of orchard cover crops, the idea of utilising the crop completely as green manure to improve the tilth and fertility of the soil is uppermost, though sometimes the benefit to the trees in saving soil erosion or removing an excess of moisture is considered.

A "catch crop" usually means a crop designed to occupy the ground (which would otherwise be bare) for a short time between main crops. It may be used as a green manure or fodder crop, but it is usually grown with the idea of augmenting the soil fertility rather than further depleting it.

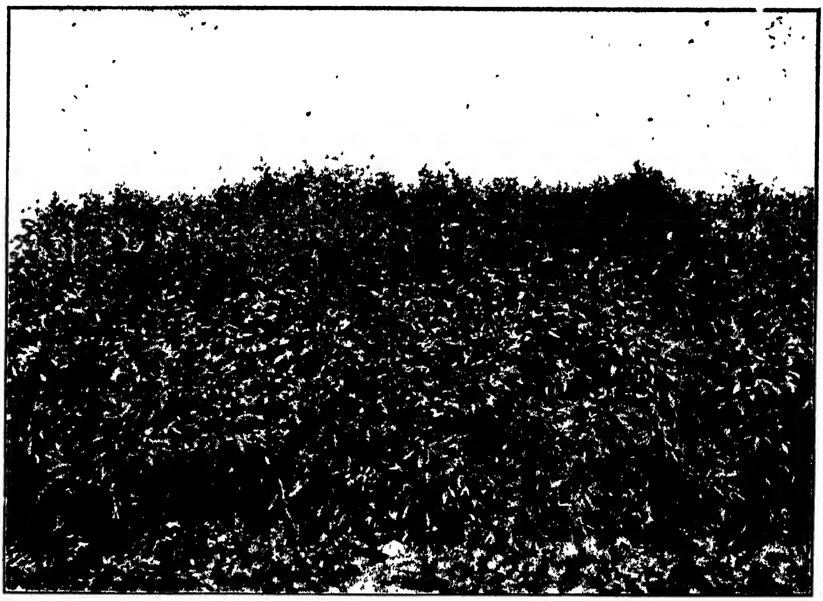
The term green manure is applied to any growth of crop or weeds which is turned under the soil in a green state. A crop may be grown specially for the purpose, and utilised either wholly or partly in this way. If only partially utilised, it may be grown primarily for stock feed, and either partly cut or grazed and the remainder turned under as green manure, or it may be fed off or cut close and allowed to make an aftermath or subsequent growth for ploughing. The poorer the soil, or the more it is run down by continued cropping, the greater the need for utilising the whole or as much of the crop as possible as green manure. The ploughing under of the dried residues of straw or stalks after the harvesting or removal of a crop from the land cannot be termed green manuring, nor can it be reckoned to be of any marked benefit in improving the fertility of the soil, though it may help somewhat in maintaining it.

In the older countries of the world where the land has been cultivated for a comparatively long time, these soil-improving crops are made to fit into a regular rotation in the farm practice. In Australia they have not definitely come very much yet into any regular rotation system, but are used occasionally in many districts. Land is held in such comparatively large areas in Australia that when observations point to the need for resting certain land from continued cropping, virgin or grass land has often been available, but such new land cannot now so often to be turned to, and the need for soil-improving crops has begun to make itself felt, and inquiries are being made from many districts as to what are the most suitable crops in this respect. It is a wise precaution on the part of the landowner to consider such crops before the land becomes greatly exhausted, for it is a difficult and costly business to rejuvenate worn-out land, whereas, by the introduction from time to time of soil-improving crops—which, by their feeding value for stock, also enable the greater practice of that safer and more dependable system, mixed farming—the fertility of the soil may be maintained, and at the same time the profits from farming increased.

Benefits of Green Manuring.

When a soil has been under cultivation for some time, particularly in grain farming, it will have been noticed that it differs markedly in physical condition (especially in the case of a heavy soil) from what it was in its virgin state. It runs together more easily with rain, remains wet or puddled more near the surface, bakes and cracks more readily in drying, and dries harder and more quickly on exposure to wind and hot sun, reducing the period for timely and optimum cultivation or ploughing, and so making it more difficult to get it into good tilth. This is to a very large extent due to the loss in organic matter or humus in the soil from continued cultivation. In many cases farmers do not realise how much extra work is required on land which has got into bad physical condition through the loss of organic matter. This loss takes place more rapidly in warm, moist districts, and with inter-cultivated crops. The bad physical condition of the soil is accentuated in heavy soils by the tendency of the clay to go into a very fine colloidal form instead of remaining flocculated. The colloidal form of clay

is so fine that it passes through the finest porcelain filter, which will arrest clay in the ordinary or the flocculated condition. It is easy to understand how an increasing content of colloidal clay, which can find its way into the smallest interstices between the soil particles, and the diminishing supply of organic matter or humus will tend to make a soil set more and more firmly. This tendency is noted wherever land is under cultivation, and the observant and understanding farmer begins to consider "soil-improving crops" as soon as he notices this effect. This cementing condition of the soil is observed by many farmers to their cost after working heavy land or allowing stock to trample it when too wet, and is becoming increasingly evident where heavy land is being irrigated, as on parts of the



Pigeon Peas at Grafton Experiment Farm, May, 1923.

Murrumbidgee Irrigation Area. This area has not been under cultivation many years, but it already exhibits in parts a physical condition of the soil worse than in any other part of the State. Green manuring here is an obviously urgent need, and it will become the more marked with every year it is postponed.

Besides improving the physical condition of the soil, the addition of organic matter renders conditions better for the innumerable microscopic forms of life which exist in the soil and which we now know to be so important in making plant-food material available.

The decay of organic or vegetable matter in the soil provides, in addition to nitrogen in available form, the mineral substances, phosphorus and potash, in a form more readily available than when derived from the soil

particles. Moreover, the actual decomposition of organic matter in the soil sets free much carbonic acid, which is of great benefit in acting on the difficultly soluble soil minerals, rendering them soluble and available to plants.

The Importance of Nitrogen.

From the standpoint of plant-food material, by far the greatest benefit from the addition of organic matter to the soil is the increase in the available important plant-food, nitrogen. The soil cannot be increased in its total phosphate or potash content by the growing of any crop, but part of the value of green manuring or rotation crops is that some of them, being more deep-rooting than the usual main crops, draw these plant-foods from greater depths and leave them in the surface soil on their decay, so that there is an actual small increase in some cases of the available phosphates and potash in the surface soil for the benefit of the succeeding main crops. The same action takes place to some extent in the case of nitrogen, and this is, of course, accentuated by the growing of leguminous crops, which, by means of bacteria in the nodules on their roots, draw on the nitrogen of the air usually more than on the nitrates of the soil, and thus, if they are totally returned to the soil, actually increase both the total and the available nitrogen in the soil.

Where the nodules are scanty or absent, such plants obtain the greater proportion of their nitrogen from the soil, just as other plants do. On rich soils containing an abundance of nitrogen, legumes are often poorly provided with nodules and thus obtain most of their nitrogen from the soil, but on such soils these legumes do not need to be grown for soil improvement (though they may be for their high feeding value for stock). On poor soils, the paucity of nodules may be due to the comparative absence of the necessary bacteria or organisms in the soil, and, if this is the case, the soil does not become greatly enriched in nitrogen, nor so much in humus either on account of the scantier growth. Practically every legume has its own strain of nodule bacteria, and such a crop grown for the first time does not usually do as well as on the same soil when it is properly inoculated with the specific organisms. Artificial inoculation of the soil is largely advised in America, but in few cases has it been of much benefit in Australia. This may be because some of our native plants or natural leguminous herbage belong to the same group of plants and carry the necessary organisms.

It is generally accepted that leguminous crops, well supplied with root nodules, obtain about two-thirds of their nitrogen from the air and the remainder from the soil. As in many cases, the amount of material produced in the top growth is about twice that in the roots, it may be assumed that when the top growth of such crops is removed from the land, and only the roots ploughed in, there is practically no increase in the nitrogen content of the soil, and that only when portion or all of the top growth of the crop or its equivalent is returned to the soil is there any increase in the soil nitrogen. That increased yields of the subsequent crop after legumes are obtained when practically all the top growth is removed is accounted for by

the fact that the nitrogen content is about maintained in the soil, whereas by the growth of other crops it would be diminished. A further contributing cause would be perhaps the increase in the availability of the nitrogen in the soil from the growth of a leguminous crop. This system does not conduce to any permanence in the improvement of the soil fertility, and farmers should beware of being misled into a sense of security in growing and removing leguminous crops (particularly short-season crops) by a comparative increase in the subsequent crop the first season. Only when the whole or portion of the top growth of the leguminous crop or its equivalent in animal manure (which is partly obtained from grazing) is returned to the soil, can there be expected to be a sufficient increase in the nitrogen and the organic matter of the soil to greatly benefit the yields of subsequent crops or to have any lasting value. And this is what should be aimed at, for

Velvet Beans at Grafton Experiment Farm, March, 1924.

it may not be economically sound practice in some districts to introduce a soil-improving crop (which is not usually a cash crop) into the rotation more often than every three or four years.

Economy and Utilisation of Soil-improving Crops.

In many cases, farmers postpone the day of introducing soil-improving crops, because they do not care to grow a crop for the apparently wasteful purpose of ploughing it in or providing feed for stock when they could be growing a cash crop, and making, for the time being perhaps, more money from the farm. Generally speaking, the growing of soil-improving crops so often or such as will occupy the land for sufficient of the season as to interfere greatly with the main crop or crops is not necessary in most parts of Australia, though there are already some soils which even require this treatment to keep farming on such land profitable. There are, however,

some instances where cover or catch crops can with benefit be introduced which do not take up the whole season or encroach on the period in which the main crop is prepared for, or grown. In some cases, the introduction of such crops is not thought of, because it is not realised how important and useful they are for the double purpose of stock feeding and soil improvement. A change in farm practice may often be necessary to introduce these crops into the farming system, viz., the introduction of or increase in farm stock for their effective utilisation, an alteration or better disposition of fencing, or a rearrangement of labour, but if these mean better returns from farming, they should be carefully considered.

Sometimes the farmer who has grown the soil-improving crop is in a quandary to know whether it should be utilised wholly as green manure, or as stock feed or hay, or partly as stock feed and partly as green manure. In the latter case, portion of the crop may be taken for hay or stock feed and the remainder, or an aftermath or second growth, as green manure. Many factors have to be considered in deciding the best way of utilising such crops, and local farm considerations are often more important than any other. Where a soil has become badly run down through continued and heavy cropping, or has got into bad physical condition through depletion of organic matter, the utilisation of the crop entirely as green manure should be regarded as urgently necessary. The deferring of such a course may ultimately necessitate an interference with the regular cropping system which it may not be sound practice to allow. When the soil really stands in need of replenishment with organic matter, it will not be good policy to try and get too much fodder value from a soil-improvement crop, especially if this crop has only a short period of growth and does not leave much organic matter in the soil from its root system—biennial or perennial crops such as clovers or lucerne are somewhat different in this respect—but when fodder is scarce and the rotation or catch crop offers good grazing (especially when stock or stock products are at good prices) the soil improvement value of the crop may justifiably be largely sacrificed.

It is possible that if a farmer starts early with these rotation crops (*i.e.*, before his land becomes badly run down or in poor physical condition) he may put them to the dual use and still maintain his organic matter sufficiently to maintain good crop yields. It is reasonable to suppose, however, that from grazing a crop (although the greater proportion of the organic matter consumed in the fodder crop is voided by stock in manure) it is only under exceptional circumstances under Australian conditions that as much as three-fourths of the manure finds its way on to the land. A fact which is worth remembering also is that the nitrogen in the leguminous green manure is quite as readily available as the nitrogen in animal manure.

In the case of biennial or perennial crops like clovers or lucerne, the time they occupy the land enables them to develop a greater root growth, and even though the top growth of such crops may be largely removed, the roots and stubble add much organic matter and nitrogen (being legumes) to the soil.

Types of Green Manure or Cover Crops.

Green manure cover or catch crops may be divided into classes, according to their time and period of growth, which make them particularly adapted to certain districts or situations. Thus there are the following groups:—

(1) Those which are sown in spring, and which occupy the land exclusively throughout the warm growing season.

(2) Those which are sown about midsummer or late summer to make their best growth before winter.

(3) Those which are sown in autumn or early winter to grow into the winter or even spring before being fully utilised or ploughed under.

(4) Those of a biennial or perennial nature, which are sown in autumn, winter, or spring, and occupy the ground for one or more years (such as clovers and lucerne), to be utilised for hay or grazing, the enlarged root growth and a little growth or stubble being ploughed in finally as green manure.

Group 1.—In the first group are summer annual leguminous crops, *e.g.*, cowpeas, soybeans, pigeon peas, velvet beans, dolichos beans, and, in cold climates, field peas and vetches. In very warm climates, such as the far North Coast, cowpeas or soybeans do not take up the whole of the growing season if planted in spring. If a crop is required there to come off or to be ploughed under in late summer or in early autumn, such crops are better than velvet beans, pigeon peas or dolichos beans, which take mostly the whole growing season. Farther south, or in more temperate climates, cowpeas and soybeans would take up nearly the whole warm season. In cooler climates, where cowpeas do not make sufficient growth, soybeans will be found to be a good substitute, while in the coldest climates field peas or vetches should be resorted to.

Crops which take up the whole of the season are generally out of favour with farmers because so much time is apparently lost and the farming or cropping system is interfered with too much. This is perhaps a correct view when the crops grown are only utilised as green manure and when the land is not badly worn or poor and does not need quickly building up to such a state of fertility as to enable profitable main crops to be grown. But where the reverse is the case, such crops which take up most of this warm-growing season are advisable.

Group 2.—In the second group are practically the same crops as in the foregoing, with the exception, perhaps, of the late-maturing velvet beans or pigeon peas. On the coastal districts a winter green fodder or hay crop like oats or wheat may run into October or November before it is fully utilised or harvested, and such a crop generally leaves the ground very dry and unsuitable for a maize crop, which does not usually do well except on very fertile soil or in a good season. Sorghum does much better than maize in such circumstances, but on land which is markedly declining in fertility and organic matter the growing of some cover or green manure crop at this stage is a wise measure. Except on the far North Coast, velvet beans

(which are best given sufficient time to come to maturity, on account of the excellent use to which they can be put) are too late to sow in midsummer unless they are intended to be wholly utilised as green manure, and cowpeas may be better. Cowpeas are also the favoured crop for sowing in early to midsummer in early maize on the North Coast at the last cultivation of the maize. In the colder tableland districts field peas and vetches would take the place of the foregoing crops for sowing in midsummer or late summer.

Group 3.—The third group consists of winter-growing annuals, such as field peas, vetches, horse or tick beans and lupins, and the annual clovers (Crimson, Berseem or Egyptian, Subterranean and Annual Bokhara) among

Biloxi, Soy Beans, at Grafton Experiment Farm, March, 1923.

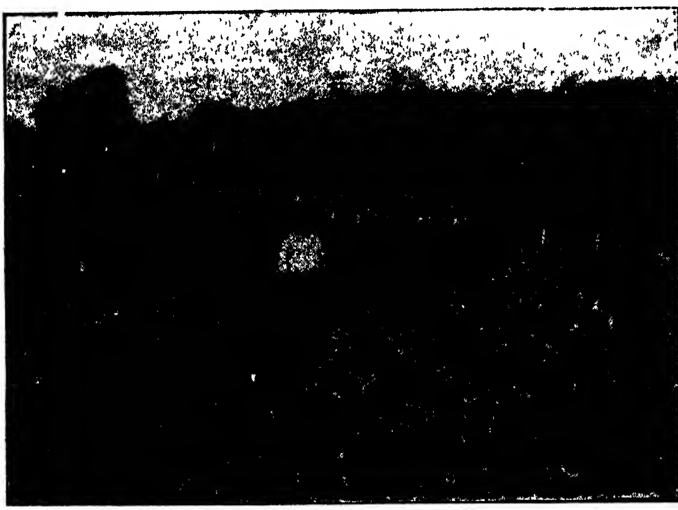
the leguminous crops, while there are some non-leguminous crops, such as the ordinary cereals (wheat, oats, barley and rye) and rape, mustard, and rye grass, which are used in part (after some utilisation as grazing or fodder) or wholly for green manuring.

Of the leguminous crops, field peas should be avoided in very severe winter climates, as they are killed by heavy frost. Berseem or Egyptian clover will not even stand as much frost as peas. Vetches should not be grown where any of the small cereals are grown for grain, as they are apt to become something of a weed pest in certain cereal crops if repeatedly allowed to seed.

Field peas and vetches are sometimes grown as a catch crop in maize, maturing at the end of autumn, but on the Macleay River are more regularly grown after the early maize crop is harvested, being utilised in part as grazing for dairy cows in late winter and early spring and the remainder ploughed in.

Crimson clover is the great winter cover and green manure crop on the Atlantic Coast of America, being widely grown, especially in districts similar to our coast, between consecutive maize crops or as a catch crop in maize at the last cultivation, but it is practically unknown here. In experimental trials it has not yet been sufficiently promising to be recommended.

Annual Bokhara clover may also be worth trial in a similar manner in the warmer coastal districts. In cold districts it would not live over winter, as it forms no resting buds like the biennial form. In districts of good winter rainfall, where the climate is mild or not too cold, Berseem or Egyptian clover makes much better growth than any other clover. It makes good hay or soiling. Subterranean clover has found its best niche so far in districts with a good winter rainfall and a dry summer. It should be sown in autumn so as to make good growth before winter. It is particularly



Cowpeas in Mr. Macinanti's Citrus Orchard near Gosford. Sown, January, 1925.

benefited by top-dressing with superphosphate, and is used chiefly as a grazing crop, even after seeding, as it leaves on the ground a large quantity of seed pods of high feeding value.

Horse or tick beans have proved successful for autumn and winter growth on the Murrumbidgee Irrigation Area, and should do well in other districts. Lupins are used a good deal in Europe, but have not yet been properly tried in New South Wales. The Tangier pea is said to do well in California as a winter crop, but seed is not yet available in any quantity here.

Among the non-leguminous crops which are used, or may be used, as cover crops or green manuring crops, the most important are rye and rape. Rye is superior to many other crops because of its great hardiness. It makes better growth on poor soil than any other crop in any district, and makes also more growth than any crop in cold weather. These qualities make it

desirable as a green manure or grazing crop to bring the soil into a state to grow better soil-improving crops, such as legumes, and as a means in the meantime of obtaining maximum growth. It is especially good as a grazing crop, as it comes quickly after being eaten off. It should, however, be kept closely grazed, as it is coarse and somewhat unpalatable if allowed to make unrestricted growth, especially in spring. Barley is a quick-growing crop, generally best suited to rich land. It does not come well after grazing. Oats are better suited to good or moist land or to cold climates than wheat. Rape has a high value for sheep or pig pasture and stands the coldest winter climate. Annual rye grass is used as a winter catch crop on the far North Coast, where it is sown at the last cultivation of late maize, and provides winter grazing for dairy cattle after the maize crop is harvested.

As green manuring crops these non-leguminous crops are not as good as legumes unless they provide a much greater bulk of organic matter, which has to make up in quantity for its lower quality. They may be more useful than legumes on very rich soils, where the main object of growing them is to provide stock feed or grazing or to prevent the leaching of nitrogen from the soil in wet winters, or, in the case of rye, on very poor soils which will not grow a legume satisfactorily.

Group 4.—Nothing can excel the biennial or the perennial crops in soil improvement. Even when their growth is largely used for hay or grazing (which gives them a greatly added value), the large root stocks add to the soil organic matter, and there is also an increase in nitrogen when the land is finally ploughed for the subsequent crop.

Among the biennial clovers, Red clover is the crop most largely grown in America, being the standard legume in rotations over several thousand acres in suitable climates in many States. It is usually sown with wheat or oats in cool climates with sufficient rainfall, and when the cereal crop is cut the clover is allowed to grow through the remainder of that season and the following one, furnishing grazing for stock or being cut for hay or seed, and the aftermath is ploughed under in autumn or winter for the following crop. Similar rotation systems are worth serious consideration in many tableland or cool districts in New South Wales, and have already given promising results on the Northern Tablelands and in the Tumut district. Red clover does not do so well on poorer soils or in drier districts. Under such conditions Bokhara clover gives better results. It requires a sweet soil and liming may be necessary. It is essential that the seed be scarified if a good germination is to be obtained. When employing these clovers with cereals, the latter should be seeded more lightly, superphosphate used to encourage the clover, and the clover seed sown or covered only very shallow on a *very firm* seed bed.

The beneficial effects of lucerne on the subsequent crops are well known, but lucerne and the biennial crops are not suited as soil-improving crops in orchards unless the rainfall or other water supply is ample so as to prevent competition with the trees for the available moisture during the summer.

(*To be continued.*)

Reports of the External Parasites in Sheep Committee of the Departmental Research Council.

No. I.—Tests of Certain Swabbing Dressings for Prevention and Treatment of Sheep Blow-fly Attack.

The duty of co-ordinating departmental work on sheep blow-fly was entrusted to the above sub-committee, which consists of Messrs. Max Henry, B.V.Sc., M.R.C.V.S., Chairman (Chief Veterinary Surgeon), A. A. Ramsay, F.A.C.I. (Chemist), H. R. Seddon, D.V.Sc. (Director of Veterinary Research), F. B. Hinton (Sheep and Wool Expert), W. B. Gurney, B.Sc. (Entomologist), and R. G. Downing, B.Sc.Agr. (Senior Experimentalist).

At a recent meeting it was decided that the experimental work done should be reviewed with a view to publication, and the compilation of it was entrusted to the Director of Veterinary Research (Dr. H. R. Seddon). The following report has, therefore, been drawn up, the conclusions arrived at from each test being based upon the reports submitted by departmental officers. These conclusions have been endorsed by the sub-committee.

In the following pages the results of all tests conducted by the Department from 1922 to June, 1925, have been collated. The number of dressings tested was seven. These were tried on sheep at various experiment farms as opportunity offered. As it is not considered desirable to refer to the dressings by their trade names they are designated by letters. It will be noted that many of these dressings have been tested on several occasions, and where possible two or more have been tested at the same farm, on similar sheep, and at the same time in order that comparative results might be furnished. Wherever possible the practice has been to leave a number of sheep untreated as controls.

The dressings tested were as follows :—

A.—A mercury preparation in a fatty basis.

B.—A liquid soap with which has been incorporated cresylic acid and allied phenolic compounds, and also unsaponifiable hydrocarbon oil.

C.—A crude soap, containing arsenic. The crude soap has probably been made from crude wool fat, as unsaponifiable material, such as lanoline, is present.

D.—Arsenic in an emulsion. Exact composition given in details of tests.

E.—A heavy hydrocarbon of the nature and consistency of vaseline, diluted with a lighter unsaponifiable oil. Naphthaline and phenolic bodies are present.

F.—Essentially a neutral tar oil.

G.—An aqueous solution of arsenic

Conduct of the Tests.

In all cases the directions given by the makers were carefully followed. The class of sheep used is given in the details of the tests.

Where sheep had been dipped immediately prior to the test the fact is stated, and similarly mention is made under the details of each test as to whether the sheep were crutched prior to the application of the dressing.

All these experimental sheep were under the close observation of departmental officers stationed on the farms and charged with the sole duty of attending to the sheep thereon. Frequent inspections would therefore be made and records kept of any sheep struck. Struck sheep were always treated with the dressings under trial unless otherwise stated.

Dressing "A."

Test No. 1, *Toxicity.*—Application of one, two, three and four drachms was made by parting the wool over lower third of rump and smearing dressing on in suggested quantities. Two sheep used for each amount—newly-shorn sheep preferred.

Report, 11th December, 1922.—Test carried out as follows:—Wool (of about three weeks' growth) was parted over the lower third of rump and dressing was smeared in one, two, three and four drachms on the skin, two sheep being used for each amount. (For over a week the wethers had been fly-blown daily in the castration wounds, but in no other part of the body, and these had been treated daily. The infestation was daily getting less).

12th December, 1922—Wounds blown.

13th December, 1922—One or two blown.

15th December, 1922—No cases of blowing in eight sheep and controls since 13th December.

28th December, 1922—Neither treated nor control sheep blown; all sheep apparently quite healthy and putting on condition. "About 2 drachms of the dressing disappeared from those areas treated with 1 and 2 drachms, completely drying up. In other cases the wool for about 2 inches from the original smeared areas became greasy and discoloured." Apparently the dressing is not toxic, and it apparently did not have any specific effect on the treated sheep, for the maggots left the controls just as soon as the former. From the commencement of the experiment no treatment was undertaken.

Conclusion.—Indefinite. Blow-fly disappearing; sheep recovered under previous treatment.

Test No. 2.—Effect on maggot-infested wounds.

Report, 7th December, 1922.—Eleven castrated rams (aged) badly blown. All traces of maggots were removed and wound treated with 1 in 100 kresol. Dressing then smeared round the wound for ¾ inch to 1 inch, and some placed on each of the lips of the wound. One ram very ill, having been blown repeatedly daily for a fortnight; it died from septicæmia.

8th December, 1922.—Eight of the remaining ten found to be badly blown. Cleaned wound thoroughly and treated with other dressings.

Conclusion.—Dressing non-toxic. Treatment of fly-infested wounds unsuccessful. Dressing did not prevent reinfestation of wounds, although smeared directly around the wound.

Test No. 3.—An attempt to infest sheep with fly larvae after treatment of such sheep with dressing.

Report, 20th December, 1922.—Two sheep treated with dressing; at the same time effort made to infest them with living larvae which had just been deposited elsewhere by

flies, or which were expressed from the living fly on to the sheep. Food material supplied in the shape of expressed liver juice to the control sheep and one treated, and faeces and water for the other treated sheep.

Result.—Within twenty-four hours all the larvae disappeared from treated and untreated alike.

Conclusion.—Indefinite. (Note: Unable to induce "striking" by placing maggots on sheep).

Test No. 4.—Date of swabbing, 17th January, 1924.

Sheep used.—One-hundred ewes treated with dressing; 100 untreated kept as controls. Sheep in very good condition, and a good number seemed to be in lamb. None of these examined at this time had been struck by fly. Neither treated nor untreated crutched.

Method of Treatment.—A patch about 2 inches in diameter was wet to the skin with water and the dressing poured on with the teaspoon supplied—Dose, one teaspoonful applied just above the tail.

Conditions under which Sheep kept.—Feed fairly plentiful, though mostly dry herbage. Fly very inactive.

Report of 20th May, 1924.—Blow-flies became active within a few days of the treatment, and have been very prevalent to date of report. Any sheep struck were treated with the prescribed dose of dressing if the area was small, up to 2 inches square. For larger area one of the other dressings was used, as it was at once seen that a teaspoonful of the dressing would not dislodge the maggots from an area over 2 inches square.

	Dressed Sheep Struck.	Control Sheep Struck.		Dressed Sheep Struck.	Control Sheep Struck.
During 1st week ...	1	2	During 9th week ..	3	2
„ 2nd „ ...	0	0	„ 10th „ ...	4	7
„ 3rd „ ...	0	1	„ 11th „ ...	1	2
„ 4th „ ...	6	12	„ 12th „ ...	3	5
„ 5th „ ...	14	15	„ 13th „ ...	5	2
„ 6th „ ...	1	11	„ 14th „ ...	2	2
„ 7th „ ...	5	6	„ 15th „ ...	3	3
„ 8th „ ...	5	5	„ 16th „ ...	9	12
			Totals ...	62	87

(1) Efficacy to repel the attack of blow-flies.—Up to date of report 62 per cent. of the dressed and 87 per cent. of the untreated have been struck with the fly.

(2) Efficacy to kill or dislodge maggots.—Specific will kill maggots on the sheep, and is of a healing nature.

(3) Dressing evidently affords but little protection from the blow-fly.

(4) Badly blown sheep treated with up to three teaspoonfuls without injurious effect.

As to the amount of development which had taken place in the maggots on sheep, maggots were found in all stages, from the commencement of the hatching to the stage when they were falling off the sheep.

Conclusion.—Apparently slight protection up to fourth week after preventive dressing (7 per cent. struck as against 15 per cent. of control sheep). Thereafter no marked difference between dressed (30 per cent.) and controls (35 per cent.). *Note.*—Almost equal numbers (fourteen and fifteen) struck during fifth week, but only one (dressed) as against eleven (controls) in sixth week. Apparently did not affect maggots deposited on sheep, as these were found at all stages.

Test No. 5.—Date, 17th October, 1924.

Sheep Used.—Fifty ewes dressed on 17th October, 1924, and boxed with flock of 150 others. One to two teaspoonfuls used.

Conditions under which sheep kept.—Sheep mated with rams from 20th October, 1924, till 16th December, 1924. Kept in timbered paddock; abundance of good feed; ewes showed tendency to hang about water and refused to travel much in long grass.

Report of 3rd March, 1925.—

	Dressed Sheep Struck.		Control Sheep Struck.	
	No.	Per cent.	No.	Per cent.
During 1st fortnight, November	2	4	7	4·6 (150 sheep)
" 2nd " "	1	2	9	6
" 1st " December	2	4	11	7·3
" 2nd " "	1	2	8	5·3
" 1st " January	2	4	4	2·6
" 2nd " "	6	12	7	4·6
Total for 3½ months ...	14	= 28	46	= 31

Conclusion.—Possibly of some benefit during first two months. Figures for first month: 6 per cent. dressed, 10·6 per cent. controls; second month, 6 per cent. dressed, 12·6 per cent. controls. If that accepted as a benefit, then we must conclude that sheep were later rendered more susceptible (third month, 16 per cent. dressed, 7·2 per cent. controls).

Summary.

As a Cure for Sheep Blow-fly.—Failure (Experiment 2). Prescribed dose will not dislodge maggots from an area over 2 inches square (Experiment 5), but as it is stated in a subsequent report on the same experiment that "dressing will kill maggots" and is of a healing nature, it would appear that in larger doses (up to three times prescribed dose) it is successful. If area large, other dressings were preferred (Experiment 4). Observed, that it took a little longer than other dressings to clear out maggots.

As a Preventive for Sheep Blow-fly.—Incidence of sheep struck during first month or six weeks possibly lessened as result of the dressing. Does not prevent reinfestation of wounds. (Experiment 2.)

**Toxicity.*—May apply up to three times prescribed dose in single dressing or in short period (three to six days).

Effect on Wool.—Has a tendency to break or rot wool at place of application.

Effect on Wound.—Said to be good. (Experiments 4 and 5.)

Ease of Application.—Easily applied.

Persistence.—Up to twice prescribed dose disappears rapidly (period not stated). (Experiment 1.)

Dressing "B."

Test No. 1.—Date, 1st November, 1923.

Sheep Used.—One-hundred ewes dressed and 100 left untreated as controls. No crutching done until a ewe was struck; then the wet and dirty wool was removed before being treated again with the specific.

*By "toxicity" is meant any "poisoning" action on the sheep treated.

Report of 21st June, 1924.—Blow-fly quite inactive for almost three months after first application.

	Dressed Sheep Struck.	Control Sheep Struck.		Dressed Sheep Struck.	Control Sheep Struck.
During 1st month ..	0	0	During 5th month ..	21	30
,, 2nd ,, ...	0	0	,, 6th ,, ...	37	30
,, 3rd ,, ...	4	8	,, 7th (24 days)	7	18
,, 4th ,, ...	11	29			
			Totals ...	80	108

It was noticed that very few were struck again, and these were found to possess wrinkles.

Conclusion.—Apparently of slight benefit during third and fourth months, blow-flies not being active during first and second months; thereafter no appreciable difference until seventh month, when only seven dressed sheep were struck as against eighteen controls. In view of the fact that during the sixth month more of the dressed sheep were struck than of the controls, no importance should be attached to the result in the succeeding month.

Taken over the whole period, while the result is slightly in favour of the dressed, the difference is not sufficiently striking to form a favourable opinion; it obviously is of no lasting benefit when it allows 80 per cent. to be struck in less than seven months.

Test No. 2.—Date, 17th October, 1924.

Sheep Used.—Fifty ewes swabbed and boxed with flock of 150 others.

Strength of Solution.—1 to 3 per cent.

Report of 3rd March, 1925:—

	Dressed Sheep Struck.		Control Sheep Struck.	
	No.	Per cent.	No.	Per cent.
During 1st fortnight, November	2	4	7	4·6
,, 2nd ,, ,,	3	6	9	6
,, 1st ,, December	4	8	11	7·3
,, 2nd ,, ,,	1	2	8	5·3
,, 1st ,, January	3	6	4	2·6
,, 2nd ,, ,,	3	6	7	4·6
Total for 3½ months ...	16	= 32	46	= 31

Conclusion.—Of no appreciable benefit.

SUMMARY.

As a Cure for Sheep Blow-fly.—Is said to dislodge maggots where skin has not been broken.

As a Preventive for Sheep Blow-fly.—Of no appreciable benefit.

Effect on Wool.—Is inclined to bleach wool.

Effect on Wound.—Is said to be irritant when applied to open wounds and to retard healing. Tends to blister if used stronger than 1 per cent.

Ease of Application.—Easily applied.

Persistence.—No observations made.

Dressing "C."

Test No. 1.—Date of swabbing, 10th November, 1922.

Sheep Used.—One-hundred ewes free from fly.

Strength of Swab.—1 lb. paste to 20 gallons water.

Report to 22nd November, 1922.—During first twelve days after swabbing, one ewe badly struck.

To 9th December, 1922.—During next seventeen days, one ewe slightly struck. Practically no fly since experiment started.

To 21st December, 1922.—During next twelve days, two struck.

To 9th January, 1923.—During next nineteen days, five struck.

To 31st January, 1923.—During next twenty-two days, two struck.

Report adds :—Practically no fly—only during early January and latter part of May.

Conclusion.—There being almost a complete absence of fly, the experiment must be considered indefinite.

Test No. 2.—Date, 1st November, 1923.

Sheep Used.—One-hundred ewes treated and 100 left as controls. No crutching done until a ewe was struck, and then the wet and dirty wool was removed before being treated again with the dressing.

Report of 21st June, 1924.—Blow-fly quite inactive for almost three months after first application.

	Dressed Sheep Struck.	Control Sheep Struck.		Dressed Sheep Struck	Control Sheep Struck.
During 1st month	0	0	During 5th month	23	23
" 2nd "	0	0	" 6th "	29	30
" 3rd "	1	8	" 7th " (24 days)	16	18
" 4th "	16	29			
			Totals ...	85	108

Report adds :—It was noticed that very few were struck again, and these were found to possess wrinkles.

Conclusion.—Apparently of some benefit during the third and fourth month (no cases of myiasis during first and second month), but thereafter no value. As 85 per cent. of the dressed sheep were struck during less than seven months, the dressing is obviously of no lasting benefit.

Test No. 3.—Date of swabbing, 14th January, 1924 (first); 25th March, 1924 (second).

Sheep Used.—Fifty Merino ewes, dipped on 1st December, 1923; thirty-seven control ewes (also dipped).

Method of Application.—With swab or small mop to crutch, and around and above tail.

Strength Used.—1 lb. paste to 12 gallons water.

Report of 10th July, 1924.—During first fifty-seven days, one ewe struck (flies now active). During next thirteen days, six ewes struck; fourteen ewes crutched. Flies very active, swabbed. Controls—one blown, and three crutched. During next three days, one ewe badly struck (previously blown and treated.) Controls, one ewe blown. (Nine days later ewes commenced lambing.)

During next 13 days, one ewe struck. Controls, one ewe blown.
" 5 days, one ewe struck.
" 9 days, none struck.
" 19 days, one ewe struck. Controls, two ewes blown.
" 17 days, one ewe struck (badly). Flies not so active.
" 5 days, ewes finished lambing. Flies not so active. No ewes blown after last record.

Report adds :—At the commencement of the experiment blow-flies were not active. All blown ewes were crutched and swabbed with dressing.

	Dressed Sheep Struck.	Control Sheep Struck.
Struck between first and second swabbing (seventy days) ...	7	1
Struck after second swabbing (seventy-six days)	5	5
Total	12	6
Equal to	24 per cent.	16 per cent.

Conclusion.—Fly almost inactive; what results were obtained were against the dressing in the first period.

Test No. 4.—Date, 17th October, 1924.

Sheep used.—Fifty ewes swabbed and boxed with flock of 150 others.

Strength Used.—3 to 4 oz. to 4 gal. water.

Report of 3rd March, 1925 :—

	Dressed Sheep Struck.		Control Sheep Struck.	
	No.	Per cent.	No.	Per cent.
During 1st fortnight, November	2	4	7	4·6
„ 2nd „ „	2	4	9	6
„ 1st „ December	2	4	11	7·3
„ 2nd „ „	2	4	8	5·3
„ 1st „ January	3	6	4	4·6
„ 2nd „ „	2	4	7	4·6
„ 1st „ February	4	8	10	6·6
Total for four months ...	17	= 34	56	= 37

Conclusions.—Dressing of no appreciable value.

Test No. 5.—Date, 13th March, 1925.

Sheep Used.—Thirty-seven ewes. Dipped, 6th January, 1925. Controls, fifty-three ewes.

Method of Application.—As a swab.

Strength Used.—1 lb. to 12 gal. water.

Report of 12th August, 1925 :—

	Dressed Sheep Struck.	Control Sheep Struck.		Dressed Sheep Struck.	Control Sheep Struck.
During 1st fortnight	0	0	During 5th fortnight	1	2
„ 2nd „	0	0	„ 6th „	0	1
„ 3rd „	0	0	„ 7th „	1	1
„ 4th „ (lambing commenced)	0	0			
			Totals	2	4
			Equal to ...	5·4 per cent.	7·5 per cent.

Conclusion.—As so few sheep were struck, the test must be considered inconclusive. No apparent benefit was conferred by the dressing.

SUMMARY.

As a Cure for Sheep Blow-fly.—Said to kill or dislodge maggots in most cases, but fails to do so if the maggots can find harbour under scabs, &c.

As a preventive for Sheep Blow-fly.—Of questionable value; one experiment distinctly of no benefit, other possibly of some benefit during the third and fourth month after dressing. Does not entirely prevent re-striking.

Toxicity.—None observed.

Effect on Wool.—Has a tendency to form grease "dags."

Effect on Wound.—It is said to be somewhat irritant.

Ease of Application.—Liquid consistency; drips and wastes from swabs. Requires dilution and boiling.

Persistence.—Not observed.

(*To be continued.*)

CONDEMNATION OF IMMATURE CALVES.

AT the last meeting of the Advisory Council of the New South Wales Agricultural Bureau a letter was received from the Metropolitan Meat Industry Board relative to a resolution passed at the South Coast and Southern Tableland district conference, asking the board to allow some compensation to consignors whose calves were condemned by the board's officers.

In its reply the board regretted that it would not be possible to alter the existing procedure. In order to protect the meat-consuming public from the danger of eating immature veal, it had been found necessary to fix a standard of weight and age for the dressed veal carcase, which standard required that the dressed carcase (with the skin on) must weigh not less than 50 lb., and that the calf should have been at least two weeks old. Calves were nevertheless frequently consigned for sale to the pig and calf markets which did not reach this standard. All such animals were confiscated, and the consignor not only received nothing for his calves, but his selling agents sent him a debit note to cover freight, charges, &c.

As a guide to those consigning calves, it was estimated that a calf which would dress 50 lb. with the skin on would weigh at least 80 lb. on the hoof. Allowance must also be made for wastage during transit, especially in the case of long journeys, so that it was not safe to consign calves which did not weigh at least 90 lb. on the farm.

RETURN OF INFECTIOUS DISEASES REPORTED IN NOVEMBER.

THE following is the return of outbreaks of the more important infectious diseases reported during the month of November, 1925:—

Anthrax	11
Pleuro-pneumonia contagiosa	14
Piroplasmosis (tick fever)...	Nil.
Swine Fever...	Nil.
Blackleg	1

—MAX HENRY, Chief Veterinary Surgeon.

Treatment of Liver Fluke by Extract of Male Fern.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research, Glenfield.

IT has been shown by several, particularly by Railliet, Moussu and Henry, Blanchard, and Marek, that male fern exerts a specific action on the liver fluke (*Fasciola hepatica*).

The basis of the treatment consists in the administration of ethereal extract of male fern given in as large doses as possible without causing toxic symptoms in the treated animal.

More recently the treatment has been tested by field trials on large numbers of animals by Montgomerie and the Departments of Agriculture in Great Britain and Ireland.

It is necessary that the preparation used should be guaranteed to contain not less than 20 per cent. crude filicin. B.P. Extractum filicis liquidum is standardised to such a strength, and is the most readily obtainable preparation. A proprietary ethereal extract, sold in capsule form to facilitate administration, may be used, but it does not appear to be any more efficient than the B.P. extract.

The value of this treatment was tested at the Veterinary Research Station, Glenfield, on a number of sheep, with excellent results. The details of this test are shown in the following table:—

Sheep. No.	Weight.	Dose	Flukes Found.
	lb.	cc.	
12	60	7·5 repeated ...	1 dead
13	90	11·25 " ...	0
15	105	12·5	0
16	104	12·5 (5 doses)	3 dead
17	80	10 (repeated) died 36 hours after second dose.	75 "
18	62	Not treated	116 live
19	75	"	182 live
20	108	"	52 live

Where the doses were repeated they were given with a twenty-four-hour interval, except in the case of sheep No. 16, in which there was a period of two days between the third and fourth doses.

The treated sheep were killed and examined for flukes six days after the last dose, and the results are shown in the last column of the table.

B.P. Extractum filicis liquidum is thick and syrupy, and therefore difficult to pour unless it has been rendered more fluid by standing the bottle in warm water. It is best to make an emulsification of the extract in milk, adding one part of the extract to seven of milk and shaking thoroughly. Such emulsification is assisted by previously warming the milk to about blood heat. An alternative method is to dissolve the extract in some bland oil, such as olive oil or liquid paraffin, using one part of extract to three of oil.

The sheep should be starved overnight and the drench given first thing in the morning. If the drench is repeated it should be given next day.

For best results the dose should be varied according to the weight of the animal. Suitable doses are:—

Of extract diluted with milk:—

Lambs 40 to 50 lb. weight—Single dose, 1½ oz. of milk-diluted extract, or ¾ oz. repeated in twenty-four hours.

Sheep 50 to 60 lb. weight—1½ oz., repeated in twenty-four hours.

Sheep 60 to 80 lb. weight—2 oz., repeated in twenty-four hours.

Sheep 80 to 100 lb. weight—2½ oz., repeated in twenty-four hours.

[NOTE.—One ounce of milk-diluted extract contains 1 drachm of pure extract.]

These doses are somewhat larger than those recommended by Montgomerie, but are equivalent to the doses recommended by the French investigators. Before treating a large number of the flock it will be as well to observe the effect of the drench on a few, to see that they are able to withstand these doses.

Of extract diluted with oil—Half above doses.

Post-mortem examination of treated sheep has shown that practically, if not all, flukes in the larger bile ducts and gall bladder are dead or have disappeared. The efficiency of this treatment for immature flukes present in the substance of the liver or in very small bile ducts is by no means so marked, and it would appear desirable, therefore, to repeat the dosing two or three times, at intervals of four to six weeks, by which time such immature flukes would have reached maturity and be present in the larger bile ducts.

Cost of Treatment.

We can conveniently take a sheep of 60 to 80 lb. weight, an average weight for a fluke-infested sheep, for computation. The dose of milk-diluted extract is 2 ounces, and the quantity of pure Extractum filicis liquidum (B.P.) in each dose would, therefore, be 2 drachms. Two doses being required for each sheep, the total quantity of extract per sheep is 4 drachms, or half an ounce.

The wholesale price of Extractum filicis liquidum (B.P.) is 18s. per lb. As 1 lb. is sufficient for thirty-two sheep, the cost per sheep works out at 6¾d. per sheep (two doses at 3⅜d.).

A Note on the Control of Rabbits.

C. WHITE, Inspector of Stock, Inverell.

MUCH has been written about rabbits, and there is difference of opinion as to the value of certain of the methods used for their control. On one point, however, there can be no difference of opinion among men who thoroughly understand the pest, and that is, there is only one way of handling it. Experience has taught that holdings must be netted, singly or in groups, and, where the area is large, subdivided into from 3,000 to 5,000 acres. The rabbits can then be cleared right out and kept out.

It must also be generally agreed that this work is well worth while, and is about the best investment a landowner can put into his property. It is the first thing he should do as soon as circumstances permit, as, until it is done, he is only wasting money in poisoning, fumigating, or trapping, as these methods accomplish no permanent good. There are always enough rabbits left to get the best of the pasture and to cause shortage of feed after a few months of dry weather, occasioning loss in stock and expense in removing them to agistment country.

It is quite true that trapping, poisoning, and fumigating have to be relied upon on certain classes of poor, scrubby or rough country, a certain amount of which is to be found in all pastures protection districts. On most pastoral land, however, and certainly on all good country, the sooner they can be dispensed with the better for the landowner.

With regard to trapping for commercial purposes (skins, &c.), the writer has no hesitation in saying that it is the best help in certain districts to keeping the pest within bounds until the landowner can handle it properly. I am quite sure that this district (Inverell) and some of the neighbouring ones would at the present time be in a much more badly-infested state but for this method. For one thing, a landowner who cannot afford to net certainly cannot afford to be continually spending money on poisoning and fumigating. This kind of trapping is relied on too much by some landowners, however, and but for it I am sure many of them would ere this have been compelled by the rabbit to net in and deal with him. This is what ultimately happens, and after some landowners show the way others follow their example. It is then that effective work begins, and the zone system as applied in Goulburn district should be put into force. In fact, it follows as a natural consequence that a landowner adjoining clean country has a greater responsibility, and if he does not realise that it is to his interest to deal effectively with his rabbits he should be forced to do so. Most of them do realise it.

In many cases rabbit-netting is erected carelessly and not looked after; in others, landowners do not go the right way about clearing the pest after securely netting. Thoroughness in this work is the keynote of success. The netting must be properly erected and regularly attended to, and when a

start is made to clear the land it must be carried right through. It is no use thinning the rabbits out and then leaving them to breed up again, as many do. The object all the time is to get the last one, and the land must be gone over regularly by a man with dogs, whose duty should also be to keep the netting in order. This is not nearly such a difficult matter, nor as costly as many seem to imagine. Nor, for that matter, is the clearing of an area of even rough land so serious if the work is tackled in the right way.

Digging out is acknowledged to be the best way of clearing land, but next to it (and cheaper) is the method of burning hollow logs, &c., trapping, and filling in burrows. This work is best done by contract. The writer first saw this method in operation on a systematic and large scale in the Merriwa Pastures Protection District. It was first done on parts of Cullingral, Terragong, and Brindley Park estates, and afterwards adopted on a large number of other properties, being most successful in all cases where done properly. More than two-thirds of the good land in that district, comprising almost all the most important and largest properties, have been cleared of rabbits, and the majority of the work has been done by that method.

The cost of the work is proportional to the price of skins, time of year, and amount of rabbit cover. For heavily-timbered country 2s. 6d. per acre is a maximum. If it is very rough as well, it may cost 3s. or 4s. On more open country, 2s., 1s. 6d., 1s., and even 6d., per acre have been paid. The contractor employs sufficient men with traps to complete a face in the paddock. Every hole with fresh workings is trapped; by degrees a certain number of holes are filled in, and the traps are advanced, leaving a percentage to catch returning rabbits, a less number being gradually required to be left behind.

Burning off hollow logs and trees, with openings at foot, proceeds meanwhile in front of the traps, and the area is gradually cleared right out in a face. Any rabbits which get behind are either caught by dogs or by traps. The steel traps are used and are the best kind.

The value of the skins helps to pay the contractor, and so the work can be taken at a lower price at a favourable time—in a dry season, for instance, when there are not many young, and in the autumn or winter, when skins are more valuable.

The method was most successful in Merriwa district, but little seems to be known about it in many places, even in the near neighbourhood.

As before stated, it is most necessary that the area of land to be cleared must first be securely netted, and afterward it must be looked after properly.

IT is estimated that to make 1 lb. of wax bees have to consume 20 lb. of honey. It will therefore be seen that if you supply the bees with the comb a great deal more money will be made.

Reports of the External Parasites in Sheep Committee of the Departmental Research Council.

No. II.—Range and Longevity of Sheep Blow-flies.

W. B. GURNEY, B.Sc., F.E.S., Government Entomologist, and
A. R. WOODHILL, B.Sc. (Agr.), Assistant Entomologist.

The importance of carcase destruction as a means of reducing the blowfly menace has been advocated persistently, but it became necessary to discover what was the nature of the menace any carcase presents, and at what distance the flies from such carcases could prove a source of infection. Prior to this work it was not known how far the blowflies travel in Australia under normal field conditions.

Among other investigations, therefore, an experiment was designed to determine this factor over an area of over 300 square miles, and also to what age the adult flies may live. This research work was carried out between 1st July, 1924, and 31st July, 1925. It was arranged to obtain data as follows:—

(1) The range of flight of the various species of sheep blowflies.

(2) The length of life of the adult blowflies in the field.

Other aspects on which data were sought were—

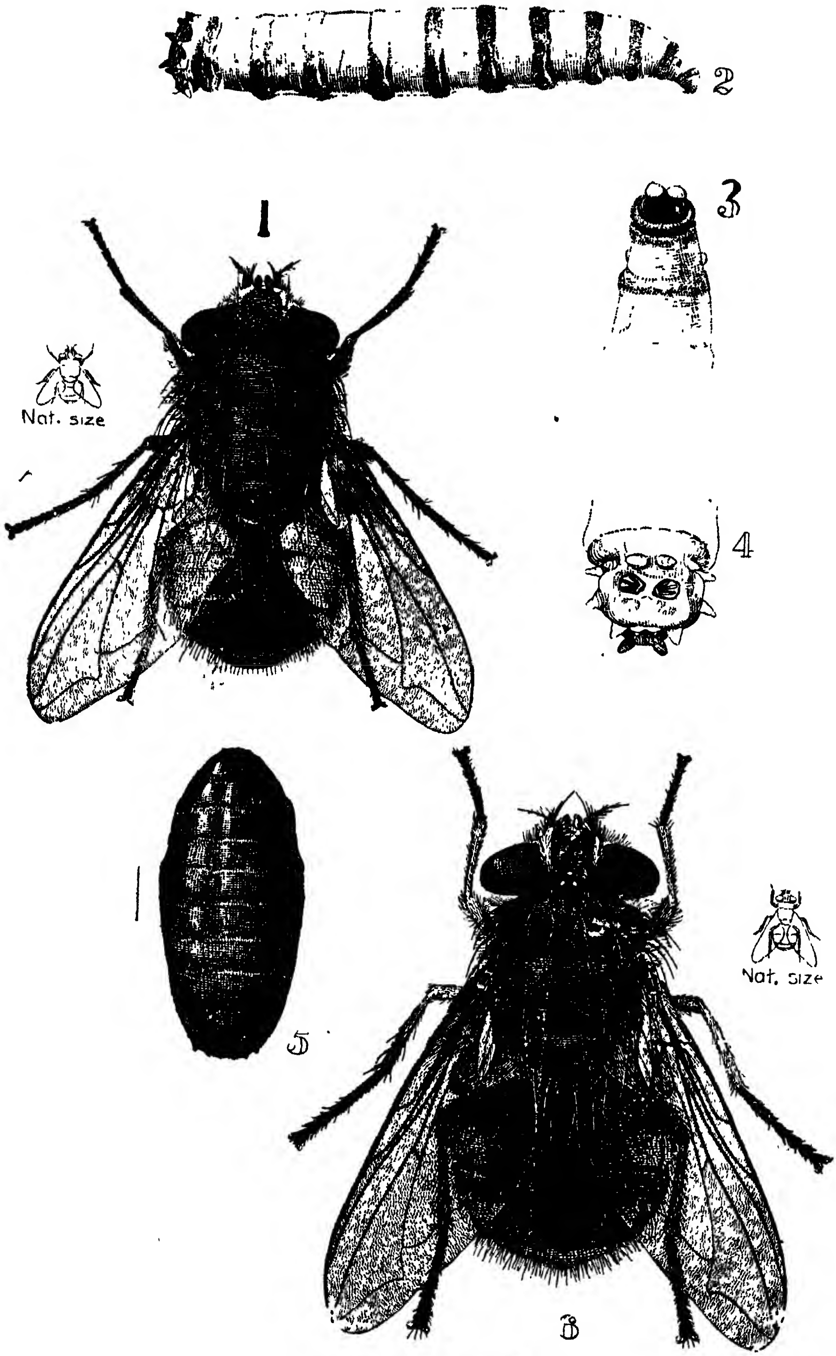
(3) The biology of the various species of blowflies.

(4) The sequence of incidence throughout the area of the different species affecting sheep's wool.

(5) The value of parasites and of the introduction of *Alysia manducator* and other parasites from abroad, which might reasonably give better control of blowflies than the parasite *Nasonia brevicornis* and others in Australia.

It was clearly recognised at the outset that the major portion of the year's work would necessarily be occupied with the range of flight and longevity tests, owing to the immense amount of labour and detailed work involved in deciding these factors under field conditions in our western sheep country. However, other data on the biology and sequence of incidence of the blowflies was also obtained.

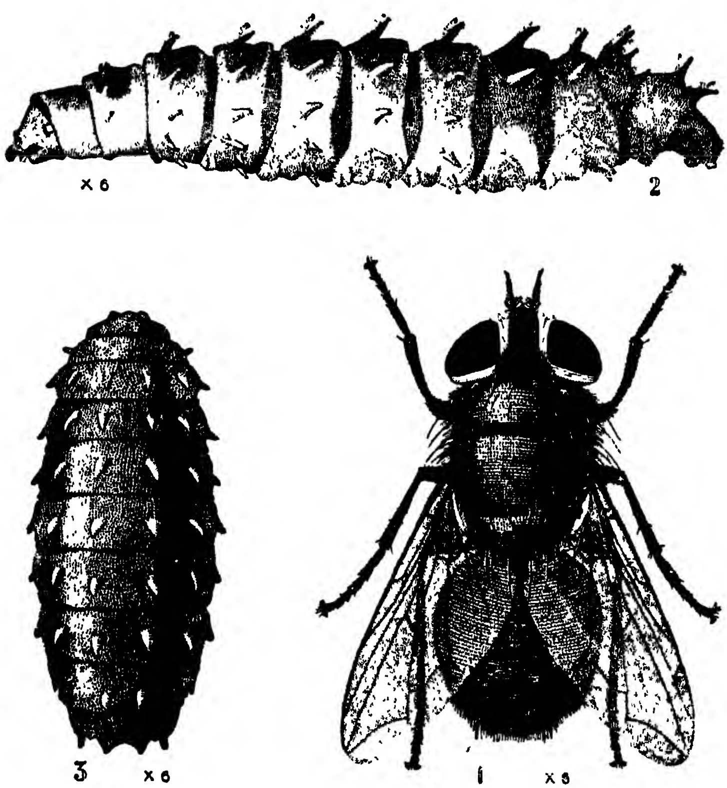
The present report gives an abbreviated account of the methods employed in carrying out this very large-scale field investigation. Over half a million (532,700) living blowflies were developed, identified, stained, and liberated, and the details concerning the methods of breeding, staining, and liberating these flies at the centre of the area recorded. The magnitude of the experiment may be gauged by the fact that the traps were distributed over the area of 314 square miles, being spaced at from 2 to 7 miles apart. In



Two Yellow-bodied Sheep Flies.

1. ***Anastellorhina augur*** **(with 2, larva; 3, head; 4, anal segment; and 5, pupa).**
6. ***Neop llenia stygia.***

visiting these traps once a fortnight the field officer had to travel, by horse and trap, over 100 miles per week. It was necessary to rebait the traps with liver once a fortnight, and also upon each visit to fumigate the trap to kill the trapped flies and to permit of their transfer to the special canisters in which they were returned to the central laboratory, where careful examinations of all specimens captured were made by the second of the present writers. The captured flies were separated into their various species, and those captured in certain traps were separated by their sexes. One million



The "Hairy Maggot" Fly (*Chrysomyia albiceps*).

A metallic green sheep fly.

one hundred and fifty thousand flies were thus trapped and identified. These, together with 532,700 living flies developed, stained, and liberated, involved the handling and identification of 1,682,700 blowflies in this one experiment.

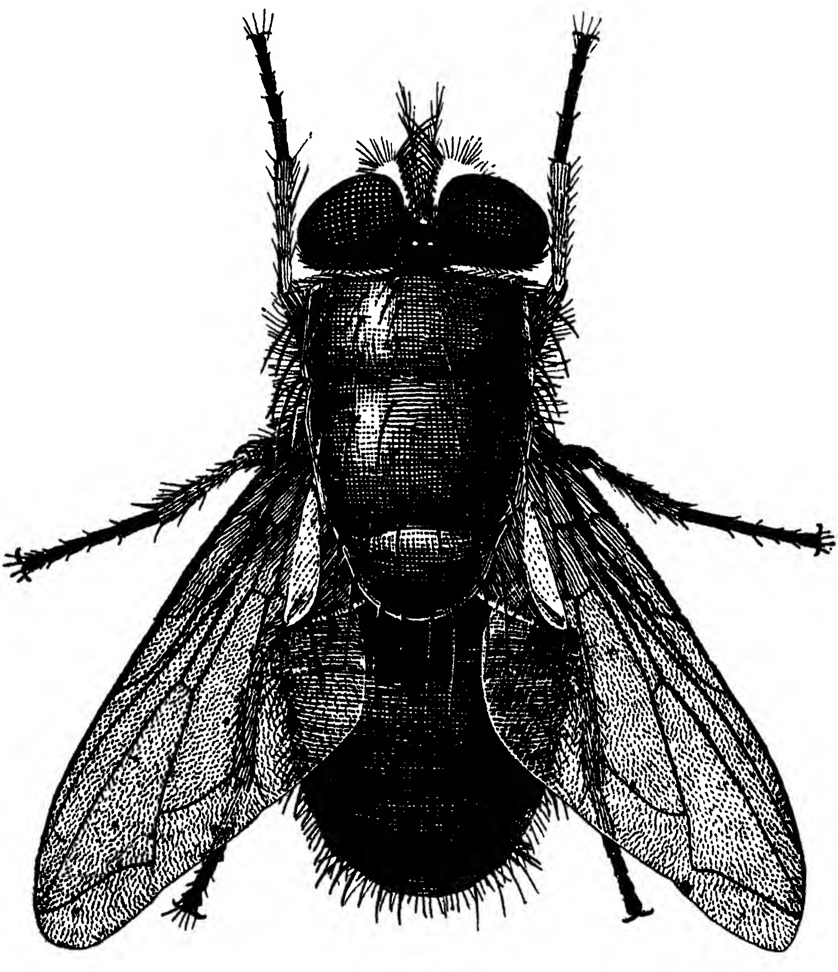
The experiment was planned and the work supervised by the senior author, who visited the area at frequent intervals. The junior author was wholly engaged in the field and laboratory work for a period of thirteen months, and with him, for a period of nearly ten months, was associated Mr. T. Staines as field assistant.

For the benefit of pastoralists and others, and to enable them to follow more clearly the results obtained, the following brief account is given of the appearance of the five species of blowflies which may infest wool on living sheep:—

(1) *Chrysomyia albiceps* is a metallic green fly, the maggot of which bears small tubercles and is commonly called the "hairy maggot."

(2) *Lucilia sericata* is another metallic green fly, rather smaller in size, but the maggots are smooth, not hairy.

(3)) *Neopollenia stygia* is a common yellow blowfly with hind body, and larger than the next species (No. 4).



Lucilia sericata.

Another metallic green sheep fly.

(4) ***Anastellorhina augur*** is another common blowfly, somewhat smaller than No. 3; hind body yellow, but with central portion dull blue.

(5) ***Chrysomyia varipes*** is a small metallic green fly, similar also to but much smaller than No. 1, with a hairy maggot.

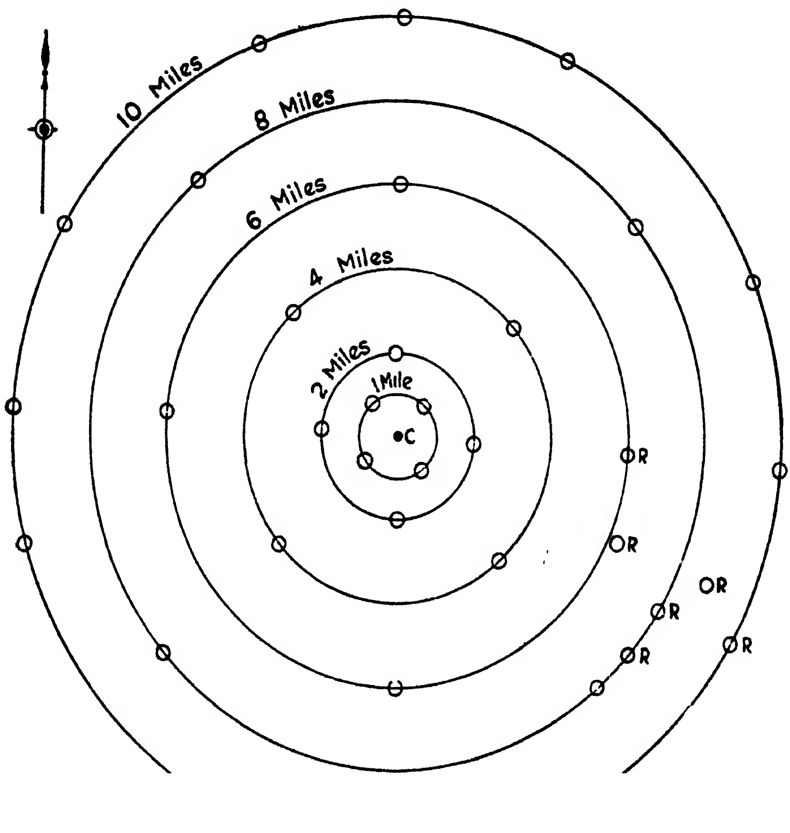


Diagram showing the Disposition of the Traps.
C—Point of liberation. R—Special record traps.

Disposition of Traps in the Selected Areas.

The accompanying diagram shows the position of the traps over an area of approximately 300 square miles of Midkin and neighbouring properties. The traps were placed at intervals from 2 to 7 miles apart, and set out at distances of 1, 2, 4, 6, 8, and 10 miles from the central point, where all the stained flies were liberated. A rather larger number of traps was placed on the circle 10 miles from the centre, but they were even then further apart from each other than the traps closer in.

Type of Trap Used and Method of Baiting.

The traps used were specially designed so that the flies, after entering, were screened off from the bait and could be conveniently collected. It was necessary to prevent the trapped flies from reaching the wet bait, as otherwise many would be wetted and discoloured in the putrefying bait, and any stain present on the wings would be obscured and it would be difficult to determine the species. The type of trap used for this work is shown in the accompanying diagram and photograph.

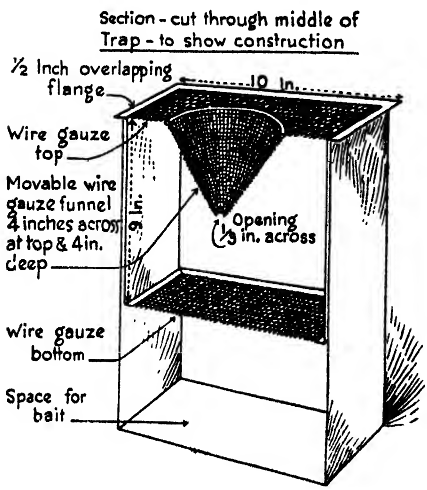


Diagram showing Construction of Special Traps Employed.

The bait used throughout was bullock's liver, one liver being sufficient to bait three traps. All traps were rebaited once a fortnight, as it was found that if the bait was kept moist it would remain effective for a fortnight in summer and three weeks or more in cool weather.

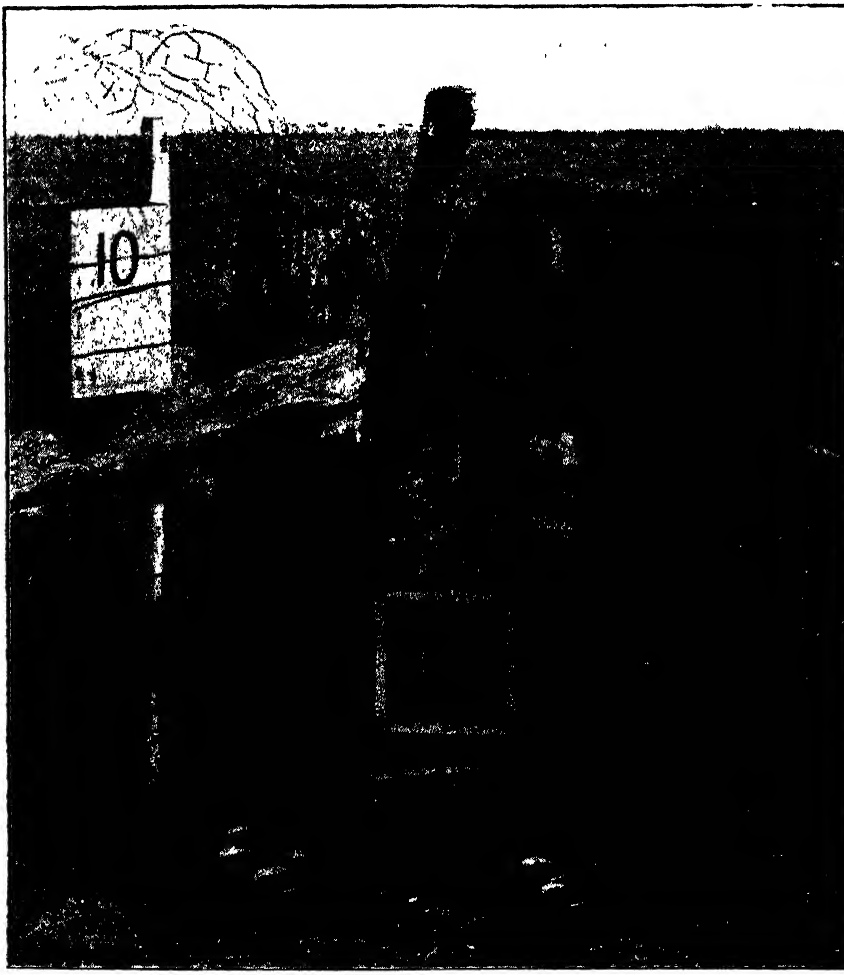
That the attractive powers of liver are very high as compared with meat from other parts of the carcase the following figures show:—Two traps were placed together, one baited with liver and the other with lean and fat meat from other parts of the carcase. Out of a total of 1,210 flies taken in the two traps over a period of sixteen days, 79·8 per cent. were taken in the trap baited with liver. The traps were placed about 3 feet from the ground to keep them out of the reach of wild pigs. To remove the living flies for examination a special fumigating box was designed, in which the movable top containing the trapped flies was placed with a charge of carbon bisulphide. The flies, when killed, were placed in tin canisters and labelled with the date and the number of the trap from which they were taken, and then taken to the laboratory for examination.

Stains Used and Method of Application.

The stain desired for the purposes of the experiment was one which would be as permanent as possible (*i.e.*, would not fade too rapidly), would adhere strongly to the wings, and would be insoluble in water, and therefore not washed off by rain. For this reason 98 per cent. alcohol was used as a solvent for the stains employed, and a small quantity of gum mastic or shellac was added to give adhesive properties. These stains had the added advantage of drying almost immediately they were applied, and thus did

not interfere with the powers of flight of the flies. The stains used at the different liberations were:—

No. 1.—A saturated solution of methyl aurin (rosalic acid) in 98 per cent. alcohol, plus 3 gms. of gum mastic per 100 cc. of solution.



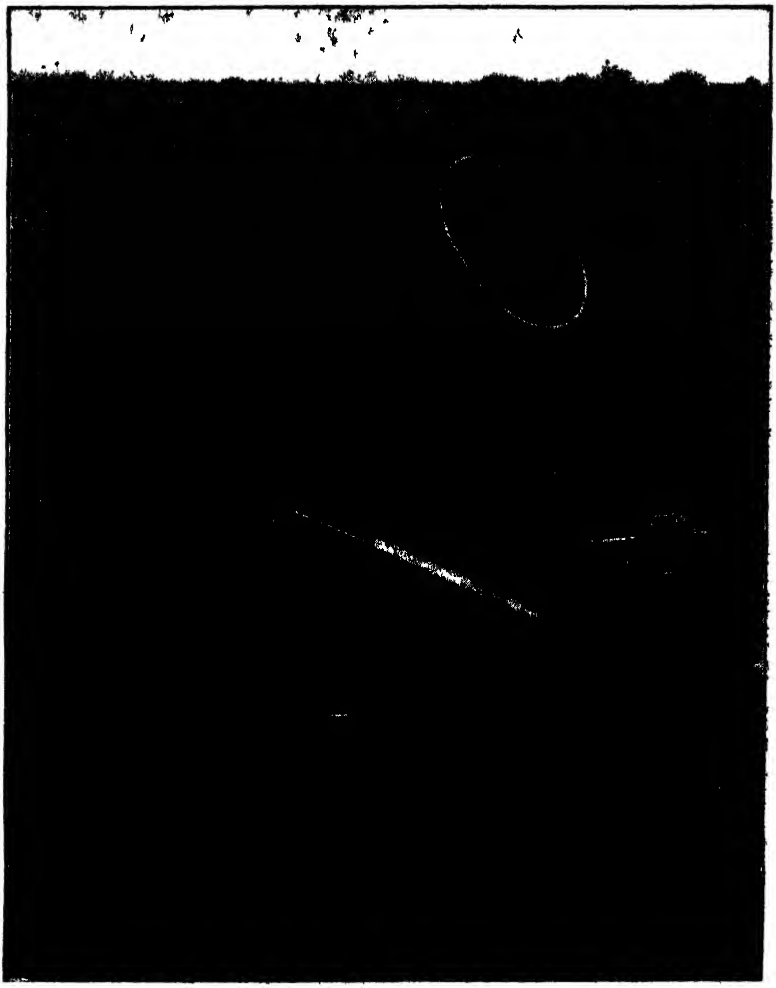
The Method of Fumigating to Kill Flies after Capture in the Traps.

No. 2.—A saturated solution of aniline green in 98 per cent. alcohol, plus 4 gms. shellac per 100 cc. of solution.

No. 3.—Similar to No. 2, but gentian violet instead of aniline green.

In order to stain the flies, they were placed in special gauze cages and the stain was applied in a fine mist through the gauze by means of an ordinary garden atomizer. By spraying right through the cages from each

side in turn all the flies were coloured. To test the reliability of this method a cage full of flies was stained and the flies killed and carefully examined. It was found that out of a total of 1,003 flies there was not a single specimen



Applying Aniline Stain to Flies through Atomiser before Liberation.

which had not at least some of the stain adhering to it. Careful comparative tests showed that the stain did not affect the powers of flight or the longevity of the flies, if it was applied with care.

THE FIRST LIBERATION OF STAINED FLIES.

Operations for developing flies for staining and liberation were commenced in October, 1924, but owing to rain and floods it was impossible to carry out the work according to plan, and the liberations extended from 1st

November to 13th December. As many as 278,000 flies were bred out in one batch, but it was only possible to liberate 12,000 of these, as flood waters between the laboratory and the centre of liberation made it impossible to get a vehicle through.

The following gives the actual number of flies stained and liberated from 1st November to 13th December:—

No. of Flies.	Species.	Date.
170	*Lucilia sericata* ...	1st Nov.
1,530	*Anastellorhina augur* ...	1st Nov.
10,000	*Chrysomyia albiceps* ...	1st Nov.
850	*Chrysomyia varipes* ...	1st Nov.
12,000	*Chrysomyia albiceps* ...	11th Nov.
190,000	*Chrysomyia albiceps* ...	8th Dec. to 13th Dec.

These flies were all stained with No. 1 stain. Owing to flood conditions, it was not possible to keep the traps working efficiently from 1st November to 11th November, and of the 24,550 flies liberated during that period only seven were recovered, and these were in traps 1 and 2 miles from the centre. After the liberation of the other 190,000, however, eighty-seven stained specimens were recovered at the following distances from the centre:—

RANGE of flight of *C. albiceps,* No. 1 Liberation.

Distance from Centre of Liberation.	No. of Stained Specimens Taken.	
	Female.	Male.
Miles.	No.	No.
1	38	14
2	24	6
4	2	1
6	1	......
8	1	......
10	Nil.	......

As it was only possible to visit each trap at intervals of approximately fourteen days the rate of spread was not accurately worked out, but results showed that the flies would travel the following distances within the times given, though probably they travelled much more quickly:—

RATE of Spread of *C. albiceps,* No. 1 Liberation.

1 mile within 2 days.
2 miles within 3 days.
4 miles within 8 days.
6 miles within 21 days.
8 miles within 25 days.

These figures do not take into account the fact that two small lots of stained flies had been liberated on 1st November and 11th November, but as

these liberations were very small it is probable that the majority of the flies caught were from the liberations of 8th to 13th December. Nevertheless, the above figures were not as conclusive as to rate of spread as in later liberations.

As the wind was variable during the period in which these records were made, no clear indication of its influence was shown.

Longevity of Adult Flies.

Based merely on the dates of this liberation and capture, the length of the adult life of the flies was from eighteen days up to possibly thirty-one days or more. For the reasons given above, however, the data collected from this first record is not as definite as those obtained from the second and third liberations.

THE SECOND LIBERATION—MARCH, 1925.

The first liberation was valuable as indicating that the flies would travel rapidly and would spread for at least 8 miles, but it was felt that more conclusive figures could be obtained. A second series of flies was therefore prepared, and from 16th March to 20th March, inclusive, 160,000 *C. albiceps* and 10,000 *C. varipes* were stained with No. 2 stain and liberated. No specimens of *C. varipes* were recovered, and the following table gives the number of specimens of *C. albiceps* taken at different distances from the point of liberation.

Distance of Trap from Point of Liberation.	No. of Stained Specimens Taken.		
	Females.	Males.	Sex not Determined.
Miles.	No.	No.	No.
1	89	43	44
2	34	28	9
4	3	...	2
6	4	1	4
8	3	...	1
10	2	...	...

Total recovered at all distances, 267.

It will be seen that the majority of the stained flies were taken in the 1- and 2-mile traps, but this by no means indicates that the majority of the flies only travelled that distance. It must be remembered that only thirty-eight traps were used over an area of 314 square miles, and that the outer traps were further apart than the inner ones. As the flies became dispersed over a wide area there was much less chance of their being caught,

and the two flies caught at the 10-mile traps undoubtedly represent many thousands that travelled that distance and were not caught. By working out a rough proportion from the number of flies caught within 2 miles,

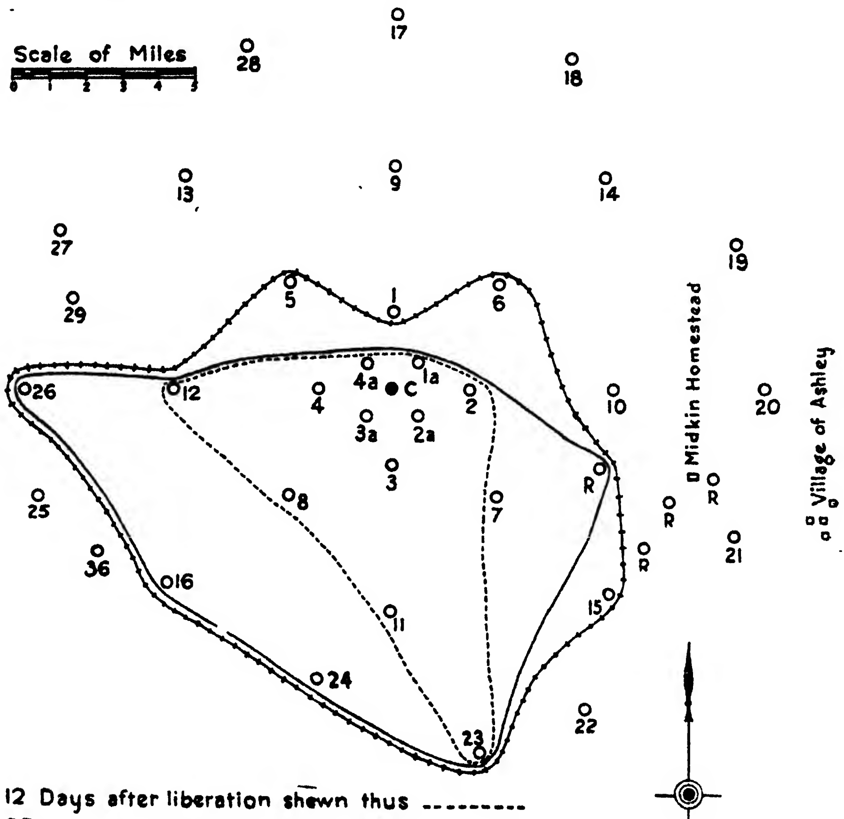


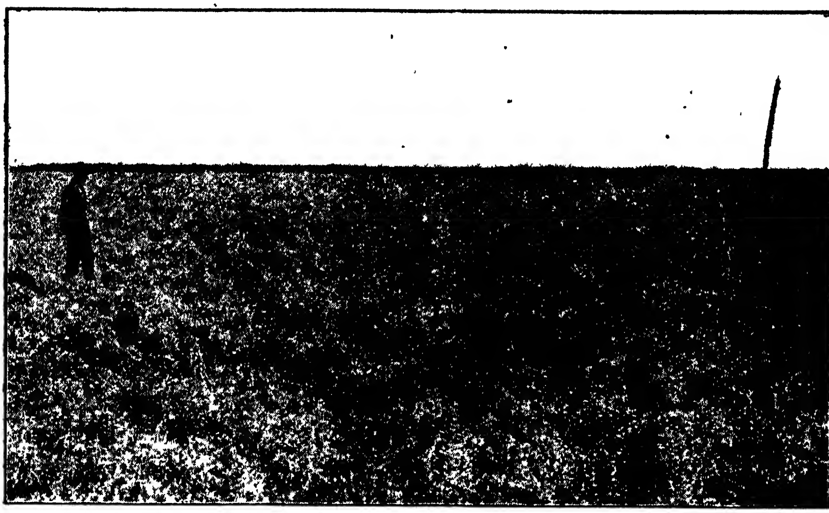
Diagram showing spread of Flies from the Second Liberation (March, 1925).
C—Point of liberation. R—Special record traps.

it was estimated that the two flies caught at 10 miles represented about 30,000 which had travelled that distance and were not captured.

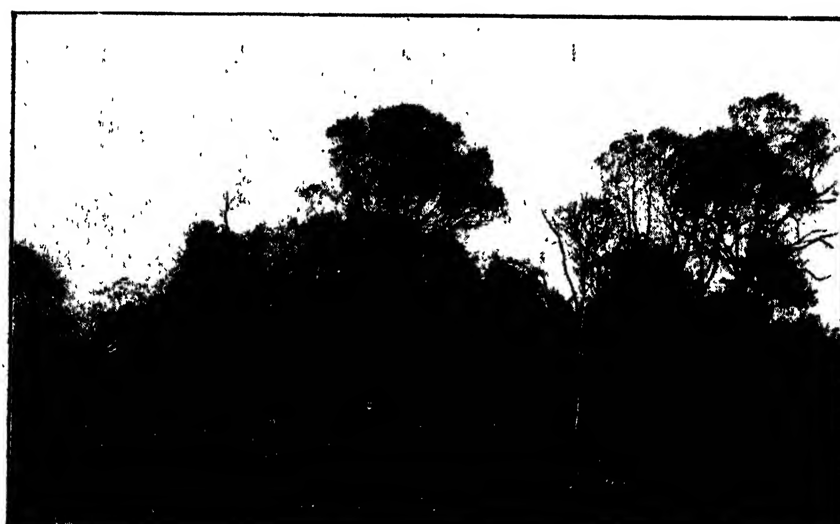
RATE of Spread of Flies, No. 2 Liberation.

1 mile within 2 days.	6 miles within 11 days.
2 miles within 2 days.	8 miles within 25 days.
4 miles within 9 days.	10 miles within 12 days.

These figures are taken from the first day of liberation to the day on which the flies were collected. It is obvious that a fly may have been set free on the last day of liberation, and have entered a trap some days before that particular trap could be cleared of flies.



Open Plain Country in which Traps were set out in these Experiments.
One of the traps is attached to the post.



Timbered Country in which Traps were set out in these Experiments.
One of the traps can be seen a little to the right in the foreground.

The Influence of Wind on Direction of Flight.

Liberations were commenced on 16th March, and from that date to 27th March the wind varied only from north-east to north-west. Flies were collected on the same day from the traps at 1 mile twice during this period, and from the traps at 2 miles once, and the number of flies taken at eight points of the compass were as follows:—

1 mile N.E., 10; 1 mile S.E., 50; 1 mile S.W., 97; 1 mile, N.W., 12; 2 miles E., 8; 2 miles S., 15; 2 miles W., 53; 2 miles N., nil.

These figures clearly indicate that the majority of the flies travel with the wind or slightly across it. When liberated the flies were observed invariably to travel down the wind, even when only a slight breeze was blowing. On the other hand, it was often observed that flies followed the smell of carrion up against the breeze. It seems, therefore, that flies, when ranging over the country in search of breeding or feeding places, travel mainly with the wind until they pick up a scent, and then may follow it up against the wind if the latter is not too strong.

During the whole period in which flies were recovered from this liberation the prevailing wind was north-east, and the accompanying chart shows clearly that the general direction they took was south-west.

Longevity of Adult Flies.

The last stained flies were liberated on 20th March, and the last stained fly was taken from a trap on 30th April. This trap had previously been cleared on 16th April. If we take it that this specimen was liberated on 20th March and entered the trap on 17th April, an adult life of twenty-eight days is indicated. If, as is probable, it was liberated before 20th March and entered the trap a few days before it was cleared, a considerably longer life would be indicated. Johnson and Tiegs, in Queensland, have recorded thirty days for the adult longevity in cages of *Chrysomyia albiceps* and thirty-five days for *Lucilia sericata.*

THE THIRD LIBERATION—JUNE, 1925.

As all the data so far had been obtained from *C. albiceps,* it was thought advisable to obtain similar data as to the three other common species. As these began to become abundant in May, 1925, meat was exposed on the 5th of that month, but on account of the cold weather the development of the flies was so retarded that they did not commence to emerge from the pupal cases till 6th June. The following numbers were liberated between 6th June and 13th June, 1925:—

Anastellorhina augur	100,320
Neopollenia stygia	26,400
Lucilia sericata	5,280
Chrysomyia albiceps	14,500
Chrysomyia varipes	1,650
Total, ...	148,150

The following table gives the number of stained flies of each species taken in traps from 1 to 10 miles from the point of liberation:—

Distance from Point of Liberation.	Total of all Species.	*Anastellorhina augur.*		*Neopollenia stygia.*		*Chrysomyia albiceps.*		*Lucilia sericata.*	
		Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.
Miles.	No.	No.	No.	No.	No.	No.	No.	No.	No.
1	85	31	11	11	11	11	7	2	1
2	95	39	5	15	6	20	2	6	2
4	17	6	...	4	1	5	...	1	...
6	2	1	...	...	...	...	1	...	...
8	11	5	1	...	3	1	1	...	...
9	3	2	1	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...
Totals ...	213	84	18	30	21	37	11	9	3

It will be seen that, as in the previous liberation, the majority of the stained flies were taken in the 1- and 2-mile traps, but, as before, the small numbers taken in the outer traps probably indicate that many thousands travelled those distances, but were not captured. It is highly improbable that any stained flies at all would be taken in the outer traps unless very large numbers travelled to those distances.

Relative Attractiveness of Traps for Different Species of Flies.

The following table shows the number of each species of stained flies liberated, and the number of and percentage of each species recovered:—

Species.	No. Liberated.	No. Recovered.	Percentage Recovered.
A. augur ...	100,320	102	·10
N. stygia ...	26,400	51	·19
L. sericata ...	5,280	12	·22
C. albiceps ...	14,500	48	·33
C. varipes ...	1,050	Nil.	...

The above indicates the *C. albiceps* is the most readily trapped.

RATE of Spread of Flies, No. 3 Liberation.

Miles from Point of Liberation.	*A. augur.*	*N. stygia.*	*C. albiceps.*	*L. sericata.*
1	Within 5 days	Within 5 days	Within 5 days	Within 5 days
2	5 „	5 „	5 „	5 „
4	12 „	12 „	12 „	16 „
6	11 „	— „	17 „	— „
8	17 „	16 „	16 „	— „
9	16 „	— „	— „	— „

As a whole, the flies did not travel as rapidly as in the second liberation.

Influence of Wind on Direction of Flight in Third Liberation.

The data obtained from this liberation confirmed the results of the previous liberation, but they need not be included here, as a full statement of all data obtained will be published in a separate bulletin.

Comparison of Liberations.

A comparison of the three liberations indicates that under warm, moist conditions with abundant water and grass, the flies will not travel as far nor as rapidly as under dry conditions in either hot or cold weather. This is based on the rainfall figures and daily records of humidity and temperature by wet and dry bulb thermometers and the thermostat.

SUMMARY AND CONCLUSIONS.

Definite data were obtained for the first time in Australia as to the range of flight and longevity of sheep blowflies under normal field conditions by means of a large-scale liberation of stained flies. The total number of stained flies was 532,700, and the total number recovered in the traps was 574. As only thirty-eight traps were employed over an area of 314 square miles, the number of stained flies captured was an extremely good result, and gave most valuable data for conclusions concerning the range of flight.

The following is a summary of the data from all liberations of stained flies:—

Species.	Number liberated	Percentage liberated.	Number Trapped.	Range of at least—
		per cent.		miles.
C. albiceps	386,500	72·5	409	10
A. augur	101,850	19·1	102	9
N. stygia	26,400	4·9	51	8
C. varipes	12,500	2·3	nil.	...
L. sericata	5,450	1·2	12	4
Total	532,700	100 0	574	

The species liberated in larger numbers naturally were more likely to be recovered in the more distant traps, but it cannot be inferred that those liberated in smaller numbers could not range as far.

(*a*) The valuable data arrived at discloses the actual range of flight of blowflies as being at least 10 miles, and proves that a single carcase is capable of infesting a tract of country 20 miles in diameter, or 314 square miles in area. Pastoralists can, therefore, be assured of the direct advantage of carcase-destruction, a measure which has been advocated by the Department from time to time, and of the far-reaching menace to sheep occasioned by neglect to destroy carcases.

(*b*) The blowfly *C. albiceps* can travel a distance of at least 10 miles within twelve days from the date of liberation; other species 8 miles within seventeen days; and all the species used in the experiment 4 miles within twelve to sixteen days. These figures do not represent the limit to which flies can travel, and it is very probable that they will travel much greater distances, since *C. albiceps* will travel 10 miles within twelve days, and has an adult life of at least twenty-eight days.

(*c*) Results suggest that approximately 10 per cent. to 20 per cent. of the flies travel from 8 to 10 miles within twelve days, while a large percentage travel 4 to 8 miles. Although comparatively few specimens were taken in the 8- to 10-mile traps, it has been pointed out that the chance of capturing stained flies in these traps scattered about 6 miles apart was extremely small, and the few captured indicate that at least the percentage given above had travelled to these distances from the centre.

(*d*) The prevailing wind has a direct influence on the direction in which the flies travel; the majority of the flies travel with or slightly across the wind when ranging over the country in search of breeding or feeding grounds, though they will follow the scent of carrion against a slight breeze.

(*e*) The length of life of the adult flies under field conditions is found to vary from at least eight to twenty-eight days, but is probably longer.

These results strongly emphasise the value of carcase-destruction. To allow carcases to remain about the paddocks developing flies creates a serious menace to sheep over a wide area, and this should be an incentive to sheep-owners to carry out the destruction of carcases co-operatively.

Further investigations as to the use of arsenite of soda wash in treating carcases for the destruction of blowflies are in hand, and also as to the effect on the maggots of jetting sheep with different strengths of arsenite of soda at different pressures.

We desire here to express appreciation and thanks to Mr. C. C. Walker, manager of Midkin Station, and to Mr. H. N. Copeland, Stock Inspector, at Moree, for their cordial co-operation and assistance.

In transmitting this report for publication the Committee desire to record that it constitutes a very important piece of work, giving, as it does, for the first time accurate observations as to the range of flight and longevity of sheep blowflies in Australia.

SILAGE, says *The New Zealand Farmer*, is an all-the-year-round feed. It replaces the elements of pasture in winter and it supplements pasture in summer. If the pasture dries up, as is too often the case, silage tides one over. If the cows are heavy milkers, silage can profitably be fed with good pasture, for the variety of succulence encourages the cow to eat more.

Those who criticise silage are the people who have never fed it. The careful man who has used it would not think of trying to dairy without it.

Genetic Research in Relation to Agriculture*

E. A. SOUTHEE, Principal, Hawkesbury Agricultural College

"OF all the sciences that contribute to the great tertiary composite which is known as agriculture, none is more important economically than genetics. . . . Without doubt vast possibilities await realisation through the more thorough and systematic development of our living economic resources. Such development is directly dependent upon the successful utilisation of genetic principles in plant and animal breeding."

Thus did the authors (Babcock and Clausen) of "Genetics in Relation to Agriculture" commence the preface of that most valuable text in 1918. To some, then, it would seem superfluous to discuss the question of the value of genetic research to agriculture, or, less broadly, to the breeding and improvement of plants and animals; but in a community where there still exists a prejudice against the research worker, where the farmers themselves, who are likely to benefit most from the patient researches of retiring scientific men, ill-paid and inadequately-equipped, are rather prone to look on those men as "cranks" with "new-fangled notions" and to tolerate them as "harmless"; in a community where the fetish of the "practical man" is set up and worshipped, it does not seem out of place to survey briefly the position.

The rediscovery, in 1900, of Mendel's researches of some thirty-five years earlier, and the realisation of their importance, mark the starting-point of a period of new outlook on the science of genetics, with its concurrent influence on plant and animal breeding. It is true that before this time there had been evolved the greater part of our domesticated plants and animals. It is also true that improvements in our plants and animals may have been made since that time without the use of the principles of Mendelism. One has only to mention the remarkable successes of Robert Bakewell, the master stock-breeder, or, coming nearer home, the work of Farrer in the development of wheats suitable for Australian conditions; of Gibson, of Tasmania, in the development, without bringing in fresh blood, of the Merino (notably his success in increasing the weight of fleece from Sir Thomas 12 lb. in 1868, to the 36¾ lb. of Patron in 1900); of the work of Cole in the development of the Milking Shorthorn. These things have happened, but an investigation of the methods used would show that the results were only slowly achieved after persistent failures; in any case the successes could only have occurred when the methods were in harmony with the underlying laws. Whereas these men were working more or less

* Notes of an address delivered before the Agriculture Section of the Royal Society of New South Wales.

"in the dark" and breeding was somewhat of a game of chance, genetic research is now able to indicate a definite course of procedure for breeding work.

The practical breeder and the student of genetics both deal with the same natural process, but from very different reasons. The former aims at maintaining or increasing the value of the animals and plants which are bred by man either for "utility" or "fancy" purposes; the geneticist aims at finding out how the characters of plants and animals are handed on from generation to generation. Research is usually readily divisible into (1) that which concerns itself with fundamentals without regard to their immediate application, and (2) research of application-investing methods by which principles already known are put to human use. The field of genetics combines in a happy fashion these two ideas.

Genetic research has been concentrated mainly along four lines:—

1. The conception and definition of "elementary species" or pure lines.
2. The phenomenon of crossing or hybridisation and the theories relating thereto.
3. The conception of mutations or sudden variations.
4. Cytological theories connected with the study of hybridisation or mutation.

1. *Pure Lines.*—By 1893 Nilsson, at Svalof, clearly demonstrated that agricultural varieties consisted of smaller groups. Ten years later the published researches of Johannsen gave the world his "pure-line theory." This embraced the following:—

(i) A variety is made up of elementary species or pure lines.
(ii) These species can be separated out by pedigree methods.
(iii) Selection within a pure line is of no avail except in those rare cases in which mutations occur.

Johannsen's work and that of others (*e.g.*, Love, Pearl, and Surface, who have carried on similar investigations) have revolutionised the methods of practical plant-breeding with respect to self-fertilised crops, such as wheat and oats, and also in some respects with regard to asexual or clonal propagation in both plants and animals. The whole question of mass *versus* progeny performance was settled, and the prime importance of the initial selection, with the necessity for large numbers in making the initial selections, was definitely established. A classic instance of the application of this theory is the production of a marked increase in the sugar content of beets by Vilmorin; another instance is the development of high—and low—protein maize by the Illinois (U.S.A.) Experiment Station.

2. *Hybridisation.*—The method of crossing two varieties, one of which has desirable characteristics, together with some which are undesirable, and the other desirable characters, which are complementary to the undesirable of the first, along with some inferior qualities, is one which has been practiced for a great number of years, particularly by animal-breeders. It was

however, the rediscovery of Mendel's papers in 1900, and the researches of Bateson, Morgan, and others that not only explained the mechanism which brought these combinations about, but also changed breeding from purely empirical selection work to definitely-planned synthetic work.

The fundamental facts of utility arising from Mendel's work are:—

(i) The heritable factors of an organism are borne by the chromosomes, the number of which is constant for any given species, and give expression to characters in groups, the maximum number of which does not exceed the number of chromosomes for the species concerned.

(ii) Plants breed true for certain characters when all factors necessary for the development of the character are in a homozygous condition.

(iii) The existence of dominance, segregation, and recombination.

(iv) There is independent segregation of certain factors, except in cases where linkage, either partial or complete, occurs.

Many examples can be shown where plant-breeders with this knowledge of Mendelism behind them have succeeded in achieving their object after they had laid down for themselves a definite goal.

One of the classical researches, and at the same time one of the outstanding applications of research, was the production, by Professor R. H. Biffen, of Cambridge University, of a beardless, rust-resistant wheat of high yielding power and good milling quality. In these studies he established among other things the fact that resistance and susceptibility to yellow rust are heritable characters. Since that time researches have been carried out with a great many types of crop plants to determine the mode of inheritance and susceptibility of various diseases affecting those plants. On the basis of these studies, workers have been able to produce resistant strains. In wheat, the work in U.S.A., of Stakman, Hayes, Melchers, and Parker on rust-resistance is too well known to need mention, while Gaines has evolved high-yielding strains resistant to bunt. In oats, Parker, Garber, and others have investigated the inheritance of resistance to crown-rust and stem-rust, and varieties have been produced resistant to both these rusts. In similar fashion workers relying on the results of genetic investigations have evolved disease-resistant plants in the case of asparagus, beans, cabbage, lettuce, timothy, tomatoes, and many other cultivated plants. Inheritance studies with regard to many other characters have resulted in the production of better varieties, *e.g.*, earliness in cereals, flour strength, smooth-awned high-producing barleys, and the round tip wrapper tobacco produced exactly to specifications, drawn up for the trade. One could enumerate many other cases of similar results.

Investigations by such workers as East, Shull, Collins, Hayes, and Jones on the phenomenon of inbreeding in maize have led to some important results. The effects of continuous self-fertilisation (in normally cross-fertilised plants, such as maize) are:

(i) The vigour, size, and yield are reduced. This is very rapid for the first two or three generations.

(ii) Inbred strains tend to become more homozygous as inbreeding continues. Genetic research has shown that this is due mainly to the elimination of recessive factors, most of which were expressed as harmful characters.

(iii) Crossing inbred strains produces plants more vigorous and higher yielding than original parent plants.

The production of first-generation hybrids in maize is considered to have great possibilities as a means of increasing the yield of that crop, and the method is indeed being used commercially in some States of U.S.A.

3. *Mutations.*—Although the occurrence of mutations in any type of organism is seemingly rare, the work of Webber, Shamel, and others with citrus fruits point to the value of investigations in this direction. The majority of such mutations or bud variations have been inferior and less fruitful than the original variety, but this knowledge has shown the necessity of careful selection and elimination of poorer types. Shamel and his co-workers have shown definitely that both quality and quantity production are heritable. Arising out of these researches, selection along the line of individual tree performance has come to be a recognised orchard practice in the United States.

In the case of the potato, too, the work of East, Webber, Myers, and Stuart has given rise to improved methods of breeding.

4. *Cytological.*—This includes such questions as chromosome number, linkage, and sterility. Dr. Sax has devoted considerable attention to these aspects of genetic research demonstrating how a knowledge of chromosome number might obviate futile attempts to combine certain desirable characteristics. The chromosome differences in the various species of wheat, as well as in the potato, have their effects on breeding problems, and emphasise the idea that where desirable combinations are sought, it is important to use forms where the cytological investigation has not shown chromosome incompatibility.

Studies of linkage relations and crossing over have shown the remoteness of the possibility of obtaining desired combinations in cases where partial or complete linkage has been determined.

The Application of Genetics to Animal Breeding.

So far an attempt has been made to show how closely genetic research and plant-breeding are bound together; how, apart from establishing fundamental truths and providing satisfactory explanations of hitherto obscure phenomena, this research has also provided a guide for the plant-breeder, enabling him to eliminate uneconomical methods and to adopt a definite procedure so that he may attain his object quickly, with surety and economically. It has also suggested new methods which might be used in cases where we appear to have exhausted all means of improvement by present methods.

In the case of animal breeding it is not such an easy matter, chiefly because of the very nature of the materials with which one has to deal, to demonstrate the applicability of genetic researches. The bi-sexual condition of animals, their sex complications and the limitation of numbers in reproduction render more difficult the process of genetic research. Such work as has been done, however, has determined the fact that animals do conform to the same principles of heredity as do plants.

The following illustrations of the application of the lines of research mentioned above will suffice to suggest the possibilities attending a knowledge of genetics:—

1. *Pure Line Concept.*—The advantages of genotypic selection as opposed to mass selection were well illustrated in the work of Pearl inbreeding for higher winter egg production.

2. *Hybridisation.*—Many studies have shown that in domestic animals Mendelian principles apply, and no case has arisen where the known facts cannot be interpreted on Mendelian lines.

The adoption of certain colours as standard for the different breeds of cattle makes important any contribution to the mode of inheritance of colour. Genetic research has been of particular value in elucidating problems connected with the appearance of non-typical colours (*e.g.*, red in Holstein and Aberdeen Angus breeds), and suggests methods of preventing and eliminating the trouble. Just as the idea has been dispelled that if one continued mating Blue Andalusian fowls one would ultimately develop a pure blue Andalusian, so, too, has it been shown that one can only be certain of obtaining a roan Shorthorn by mating particular types of red and white animals. The production of disease-resistant hybrid cattle has been carried out in India and other places. The inheritance of milk production has been studied by Gowen and others, and the following facts established:—

(i) Milk yield and milk quality are definitely inherited.

(ii) Both parents are responsible for milk yield of offspring.

(iii) Factors for high milk yield are partially dominant.

(iv) Factors for high butter-fat percentage are partially recessive.

It has been definitely determined that pedigree itself is not a guarantee of performance, but that progeny records must be analysed.

The knowledge gained from genetic research has helped to disprove such theories as those of telegony, maternal impressions, acquired characters, prepotency, reversion. With regard to inbreeding, this is no longer a question as to whether or not it is, *per se*, injurious. The long continued researches of Pearl, Wright, and Miss King have shown that inbreeding is a means of analysing and of purifying stock by elimination of undesirable qualities. Whether good or bad results arise from inbreeding depends solely on the constitution of the organism before inbreeding is commenced. The advantages of outbreeding in securing hybrid vigour have also been demonstrated, and such problems as sterility of hybrids, gynandromorphs, and sex-linkages have been studied, and useful knowledge gained.

Enough has been said to show the importance of genetic research in relation to plant and animal breeding. It has to be acknowledged that the optimistic predictions of early workers have not been entirely fulfilled. The process of establishing genetic relationship between characters or groups of characters has not been as simple as the earliest researches seemed to indicate, and the interaction of genetic factors has become surprisingly complex. There remain many fundamental questions for attack, many practical problems for elucidation. For the plant-breeder one only has to mention the problem of the inheritance of yield and the setting up of linkage groups in the case of wheat. These problems can only be elucidated by men thoroughly trained in genetic principles and with a knowledge of biometrical methods; and it is safe to predict that not only will the science of genetics play a considerable part in plant and animal breeding operations, but it will also be of great importance in furthering the agricultural progress of Australia.

BEAUTIFICATION WITH TREES.

BESIDES its economic functions in relation to agriculture, the Department acknowledges a certain æsthetic duty toward the residents of New South Wales. Most people are more or less familiar with the beauty spot constituted by the Sydney Botanic Gardens, but fewer are aware that practical assistance is given to those desirous of beautifying similarly with tree or shrub some other little corner of the State. Last year some 153,000 specimens were distributed from the Botanic Gardens and the State Nursery to public bodies. Shade and decoration in streets or the grounds of schools, churches, and similar buildings were the principal purposes for which these trees were used.

THE AMERICAN TOBACCO-GROWING INDUSTRY.

SOME idea of the magnitude of the American tobacco-growing industry is obtained from an article in the *Western Tobacco Journal*. It is stated that the United States produces about 35 per cent. of the world production of tobacco. Last year the crop was estimated at 1,243,000,000 lb., with a farm value of 256,000,000 dollars. Tobacco is grown commercially in more than one-third of the States, but Kentucky, North Carolina, and Virginia produce about 70 per cent. of the crop. In these States tobacco is the principal agricultural product. The unprecedented demand for cigarettes in recent years is reflected in the changes in the relative quantities of the several types of tobacco grown. The average of the last two crops of bright flue-cured tobacco (more than 500,000,000 lb.) covers nearly twice the average of 1913-14. The quantity of leaf exported from the United States in 1924 was 546,000,000 lb., as compared with an average for the last five years of 487,000,000 lb., which average is about 25 per cent. greater than that for the five years ended 30th June, 1914. The United Kingdom is the principal market for these exports, taking on the average about 40 per cent. of the total.

The Relationship of the Botanic Gardens to Agriculture.

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Biologist and Director of Botanic Gardens.

THE Sydney Botanic Gardens have perhaps been more intimately associated with agriculture from their earliest foundation than any others, for, when the infant colony of New South Wales started its development in 1788, the land taken over for Government purposes by the far-seeing Governor Phillip was used to plant the seeds that the fleet had brought from the Old Country, and those old oblong-shaped beds that one sees in the Botanic Gardens at the present day are the very spots where the earlist colonists conducted their first horticultural trials with the seeds that they brought with them. Moreover, the very name, Farm Cove, the waters of which bound the Botanic Gardens, arose from the fact that here the first crops of cereals were raised. The area now known as the Botanic Gardens was first definitely known by that name in 1816, and we may contrast with astonishment, and with satisfaction, the progress of agriculture in this State with its primitive origin in that historic spot.

The flowers and plants indigenous to the new colony were so remarkable, and were so different to those of other countries, that Botanic Gardens situated elsewhere were only too glad to make exchanges with the Botanic Gardens of Sydney; and thus, in a comparatively short time, many plants from the older countries were introduced into New South Wales.

But the indigenous plants in the new colony were themselves interesting and their properties unknown, and it was necessary to collect, name, classify, and examine them. These two great works—the collection of living plants and the collection of dried specimens—have gone on until to-day the Sydney Botanic Gardens occupy a prominent position among the notable botanic gardens of the world.

In looking back at the history of Botanic Gardens in general, we find that one of the impulses that has stimulated men to travel far and wide over the surface of the globe is that arising from the desire to obtain spices and drugs, and when they have been found there has followed naturally the establishment of gardens in which to propagate the plants yielding the desired commodities. Francis Bacon reminds us that "God Almighty first planted a garden," and we are still exercised to seek out and to grow "every tree that is pleasant to the sight and good for food."

As already indicated, the Botanic Gardens of Sydney were from the very first connected with agriculture. Many people regard the Botanic Gardens only as a very pleasant place in which to spend an afternoon, as a resting place or a picnic-ground, where one can sit on lawns, 'mid the scent of

flowers and surrounded by arboreal beauty. Nothing perhaps is more restful and more health-giving than to have the mind soothed by the contemplation, amid pleasant surroundings, of vistas of floral beauty, and one of the greatest charms of a garden is the feeling of serenity and peace produced by large masses of foliage and quiet green lawns near sheltering, cool retreats.

The staff of the Botanic Gardens have always kept the beautification of the gardens in mind, and many there are who deeply appreciate what has been done in this direction. Every tree, every plant, every bed is the subject of thought and consideration, and not one is ever planted, removed, or cut down without due deliberation as to its present and future influence upon the general scheme. But, in addition to the upkeep of lawns and flower-beds and shrubberies, a vast amount of work directly related to agriculture is carried out.

The Horticultural Section.

While many plants have been introduced, acclimatised, and tested out, newly-discovered plants, new horticultural creations, and new uses of known plants are always arising. It is to the Botanic Gardens that all and sundry make application concerning these for advice and directions for culture. Hence, at the Botanic Gardens, an effort is made to test the relative horticultural value of old and new plants by the formation of comprehensive collections. People may ask: What has this to do with agriculture? But gardening is the very refinement of agriculture, and the difference is only one of degree and intensity. Hence, in the gardens there are beds devoted entirely to native plants, beds devoted to succulents, beds devoted to plants of the lily type, beds devoted to plants from Japan, beds devoted to medicinal plants, beds devoted to the ancient and interesting group of cycads or burrowangs, houses devoted to the culture of ferns, and houses devoted to the culture of orchids and to tropical plants.

Every student of agriculture must learn something of the life of the living plant, and the greater the variety of living plants studied, the more complete will be the knowledge of agriculture. Here students of agriculture and others from Sydney University and elsewhere find illustrations of every phase of plant life.

It is moreover, part of the duty of an agriculturist to understand and to interpret the natural vegetation of his district. In this the Botanic Gardens can greatly assist him. Much is heard to-day about the necessity of a soil survey, but it must not be forgotten that the native plants have been surveying the soil of this country for countless ages. In the early days of accurate analytical chemistry much was expected from soil analysis; some people still cling to a belief in the value of a chemical analysis of the soil, and speak of it as if it could be the means of solving all their agricultural problems. But most of those who have had much experience agree that a chemical analysis of the soil only gives just a little informa-

tion, and that a knowledge of the physical condition of the soil is of more importance. Further, they will agree that to those who have observed and can interpret their observations, a knowledge of the natural flora that grows upon a soil is a surer guide to the class of agricultural crop that can be successfully grown upon it than either a chemical or a physical investigation.

A phase of special horticultural interest is dealt with at the State Nursery attached to the Botanic Gardens. Here native trees and native shrubs, and trees and shrubs from other countries, are tested as to their suitability for various localities and conditions in our State. Of those that have been found suitable, thousands are raised annually. Last year 153,000 plants and trees were distributed to various public bodies and to schools. Among these latter are schools of all denominations, and it is noteworthy that, whatever their teaching and their tenets, they all seem to agree in this particular, that the more beautiful you make the surroundings of children, the more likely are they to lead beautiful lives. The trees distributed by the Botanic Gardens to municipalities and shires should not be without their influence on agriculture, for probably the more beautiful you make the surroundings of a country town, or district, or home, the more likely are people to stop there.

The National Herbarium.

Housed in the Botanic Gardens is the National Herbarium. It is a collection of thousands and thousands of carefully-preserved plant specimens from all localities in New South Wales, from all the other States, from the adjacent islands of the Pacific, and from other countries. These specimens are all named, classified, and arranged systematically. To many they will appear dry and uninteresting, and to those who are dealing with them they sometimes appear almost overwhelming in their numbers. But they are of absolutely fundamental importance to agriculture. Not a day passes but specimens are submitted to the Botanic Gardens by shire councils, by teachers, by members of expeditions, by the Stock Branch, by stock inspectors, by farmers, by foresters, or by those engaged in the distillation of vegetable oils, asking such questions as: What is the name to this plant? To what natural order does it belong? What is its country of origin? What are its properties? Has it any commercial value? Is it poisonous? Is it likely to become a pest? How can it be eradicated?

To such questions answers can only be furnished by those who have made a prolonged study of the collections in the National Herbarium and of the vast literature dealing with the plants contained therein. The information sent out is desseminated throughout the agricultural community, and of its interest and value there can be no question. Both in the horticultural section and in the National Herbarium we maintain with countries all over the world an active exchange of living seeds and of dried specimens, and in this way the Botanic Gardens are continually being enriched.

Agricultural Seeds and Fodder Plants.

It has been said by some that New South Wales is climbing to prosperity on the sheep's back; others think that it is climbing there on the cow's back. In reality it is climbing there by growing wheat, sorghum, maize, lucerne, native grasses, exotic grasses, and making the most of its indigenous pastures. Its prosperity depends primarily not on its sheep nor on its cattle, but upon the food of these animals, upon the seed which is sown, upon the purity of the seed, upon its vitality, and upon its suitability for particular districts. Over all these matters vigil is maintained at the Botanic Gardens by examining commercial seed samples for purity and germinating power, by pot trials, by field trials, by inspections in the field, and by the comparison and classification of reports from farmers. The necessity for the protection of the farmer from the careless distributor of weed seeds is obvious, and in the establishment of a type collection of weed seeds for comparative purposes the National Herbarium has been of material assistance.

The Biological Section.

In recent years perhaps no subject has received more intense study, and no study has been of greater value to the human race, than the study of biology; that is, the study of life itself. It must not be forgotten that it was a botanist, Robert Hooke, who, in 1667 first discovered the cell, the unit of life in every plant, and also in every animal. And let us not forget that it was a botanist also, Robert Brown (who contributed much to our knowledge of Australian plants) who, in 1831, first discovered the nucleus, that minute centre of living matter that occupies the interior of every cell, whose whole behaviour it dominates.

With the progress of thought and with the perfection of the microscope, we have been able to satisfy that instinct which is gradually unveiled as we grow older, that prompts us first to take note of the form of living things, then to inquire as to their origin, and finally to investigate the mysterious gift of life that they possess. We marvel, and love them none the less. The fierce controversies that heralded the gradual adoption of the theory of evolution have passed away; we now seek to interpret our present life in terms of the past. This can only be done by studying not only the life history of any living plant or animal, but its relation to all the other living plants or animals in its vicinity. Hence botanic gardens are now no longer mere collections of plants, but centres of research into the phenomena governing plant life, and in this the Sydney Botanic Gardens are not remaining behind. The soil, formerly regarded as dead and inert, is found to be the home of countless small plants or bacteria, upon which its very fertility depends.

Diseases of plants and animals, formerly regarded as dispensations of Providence, are found to be due to minute fungi or bacteria that have become parasites on an enfeebled host. Such discoveries have led to a new agricultural outlook. Progressive farmers no longer abandon themselves

to fate, but demand to know the cause of a disease and the remedy. Such remedies have been found to be the adoption of certain cultural methods, certain chemical treatment of the seed, treatment of the crop with sprays, or the breeding of strains resistant to disease. The fundamental studies for such work are carried out at the Botanic Gardens, to be translated into the larger fields of agriculture.

There has been some indication recently that the value of agriculture to the community, as opposed to manufacture, may be underrated. Having shown the intimate relationship between the Botanic Gardens and agriculture, and having in mind the possibility of its importance being underestimated, we may conclude by recalling a remark made by Napoleon in one of his letters. It may be remembered that Napoleon was chosen by the great American essayist, Emerson, as his typical man of the world, and this is the observation of this typical man of the world: "Finances founded upon a flourishing agriculture can never be destroyed."

To Get Rid of Sorrel.

"My soil is a light sandy nature and is overrun with sorrel."

To a Uralla farmer, the Chief Inspector of Agriculture replied that in a district where the rainfall is comparatively heavy it is difficult to control sorrel as the soil cannot be dried out. When the season is dry it is fairly easy to kill sorrel by cultivating the land frequently and thoroughly to get it well dried out. The best method would probably be to plough early in the spring, and work frequently with the springtooth cultivator; this would bring the sorrel to the surface and as much as possible should be gathered together and burnt.

Birds—Friendly and Otherwise.

The evidence for and against the birds called the "Twelve Apostles" or "Happy Family" is conflicting, many farmers considering that they destroy an appreciable quantity of wheat, while Mr. W. W. Froggatt, late Government Entomologist, reported that they are mainly insectivorous and should be protected. Examinations of the stomachs of these birds were made some years ago, and out of thirteen stomachs the majority contained seeds and several had wheat grains, but a number were found to contain fragments of insects. Mr. May, Manager of Bathurst Experiment Farm, does not think they do any serious harm to wheat. The evidence, I think, points definitely to a mixed diet, and it is conceivable that sometimes they do cause damage to wheat, but this is based on the limited number of stomachs examined and recorded in 1914.

With regard to the Black-backed Magpie, the evidence seems to be that it feeds on fruit and seeds to some extent, and that it is certainly a pest of fruit at times, though there is evidence from the stomach contents that they also are sometimes insectivorous. The Black and White Magpie seems more definitely insectivorous and useful; it will feed on wheat, but it not looked upon as a crop pest.—W. B. Gurney, Government Entomologist.

The Packing of Peaches.

TRIALS AT YANCO EXPERIMENT FARM.

W. W. COOKE, Orchardist.

THAT the manner in which a fruit case is made up—that is, with the depth slightly greater than the width, or *vice versa*—should have any effect on the manner in which fruit will pack in it seems strange, as the dimensions and capacity are not altered. Such, however, is the fact, and fruit which occasionally will not pack the right height in a case made up the usual way will almost always pack satisfactorily if the make-up is changed so that the depth becomes the width.

Though the trouble is not often met with in the bushel case owing to its greater depth, it frequently occurs when packing fruit in the Australian half-bushel case. The dimensions of this case are 18 by 8⅝ by 7⅛ in. The length is 18 inches, and usually it is made up with a width of 8⅝ inches, the depth being 7⅛ inch. It can, however, be made with the depth 8⅝ inch, the width then being 7⅛ inch. Packing experiments to determine which was the best way to have the case made have shown that both possess advantages, and that if both types were available packing was easier, and the appearance and quality of the pack was greatly improved.

The trials showed that when packing peaches about 60 per cent. could be packed successfully in the case with a depth of 7⅛ inch. The remaining 40 per cent. did not pack well in the case made up in this way, but did so when the case had a depth of 8⅝ inch.

The accompanying table shows the pack, count and approximate size of the fruit in the two cases; sizes that do not pack well in No. 1 case have been omitted from the chart for that case and are included in the chart for No. 2. It will be seen on reference to the table for case No. 1 that fruit 3 inches and over will pack either 2—1 or 2—2, the number of tiers being three in each instance. This is due to the difference in shape of the various varieties of peaches.

The illustrations show the two cases packed. Fig. 1 shows case No. 1 packed 2—1, 6—5 (fifty peaches), and Fig. 2 the same sized case packed with smaller fruit 3—2, 6—5 (110 peaches). Fig. 3 shows case No. 2 packed 2—1, 5—4 (fifty-four peaches), and Fig. 4 the same case packed 2—1, 7—7 (eighty-four peaches).

By the use of the two cases—that is, the Australian half-bushel case made up the two different ways—it is thus possible to pack all sized peaches from 3¼ inch or over to 2 inches or less, with the least amount of trouble and to the greatest advantage for the safe carriage of the fruit.

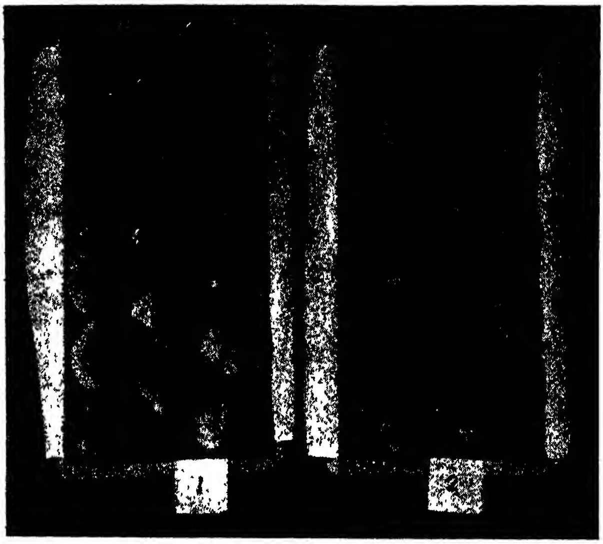


Fig. 1, showing 2-1, 6-5 pack. Fig. 2, showing 2-1, 7-7 pack.

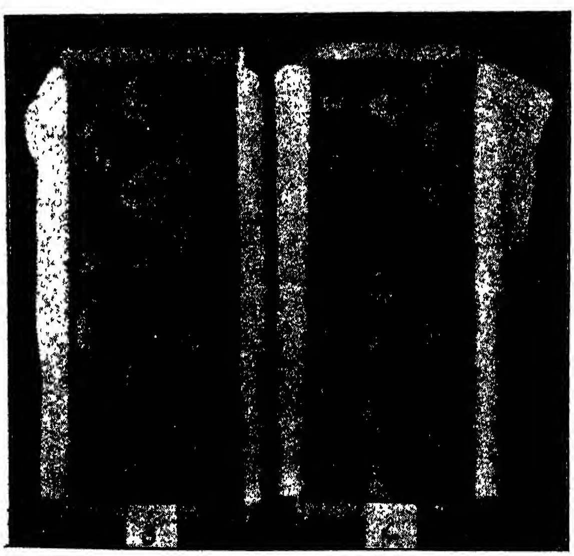


Fig. 3, showing 2-1, 5-4 pack. Fig. 4, showing 2-1, 7-7

TABLE showing pack, count, and approximate size of fruit in Case No. 1 (Depth, 7⅛ inches).

Pack.	Tiers.	Count.	Total in Case.	Approximate Size. of Fruit. (Inches.)	Remarks.
2–1	3	5–5	45	3¼	Packed on edge. Good.
2–1	3	6–5	50	3⅛	Packed on edge. Good. These do not pack well in case No. 2.
2–2	3	4–3	42	3¼	Packed on edge. Good.
2–2	3	4–4	48	3⅛	,, ,,
2–2	3	5–4	54	3	Packed on edge. Good. These do not pack well in case No. 2.
3–2	4	5–5	100	2⅜	Packed on edge. Good.
3–2	4	6–5	110	2¼	,, ,,
3–2	4	6–6	120	2⅛	,, ,,
3–2	4	7–6	130	2	Packed on edge. Good. These do not pack well in case No. 2.

TABLE showing pack, count, and approximate size of fruit in Case No. 2 (Depth, 8⅜ inches).

Pack.	Tiers.	Count.	Total in Case.	Approximate Size of Fruit. (Inches.)	Remarks.	
2–1	4	5–4	54	3	Packed on edge.	Good.
2–1	4	5–5	60	2⅞	,,	,,
2–1	4	6–5	66	2¾ (full)*.	,,	,,
2–1	4	6–6	72	2¾ (bare)†.	,,	,,
2–1	4	7–6	78	2⅝ (full).	,,	,,
2–1	4	7–7	84	2⅝ (bare).	,,	,,
2–1	4	8–7	90	2½	,,	Rather low.

* "Full" means, in this instance, a range of 2¾ to 2⅞ in., the larger percentage of the fruit approaching 2⅞ in.

† "Bare" means a range of 2¾ to 2⅞ in., the larger percentage of the fruit approaching 2¾ in.

A SUCCESSFUL BRITISH FRUIT ADVERTISING CAMPAIGN.

ACCORDING to the Federal Department of Markets and Migration (Melbourne) the British "Eat More Fruit" advertising campaign in Great Britain supplies a much needed complement to the auction method of distribution.

By the use of newspapers, posters, window cards, strips, &c., the slogan "Eat More Fruit" has been kept before the public in various forms, while advertising copy calls attention to the benefit of using certain fruits, such as apples, oranges, grapefruit, lemons, grapes, &c., in season. Music halls, radio and talking machines have also been utilised to preach the gospel of fruit consumption. The results so far have been such a success as to encourage further efforts. Although the campaign is not yet two years' old, its influence is apparent to those who have examined the fruit trade closely.

Pea Experiments at Oberon.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

THE Oberon and Orange districts are the chief centres for pea production in the central west. The area under this crop, however, varies considerably from season to season, due chiefly to the uncertainty of the market. There is no co-ordination of supply and demand, and the market is easily glutted. In the 1923-24 season the area under peas was considerably greater than ever before, and a favourable season meant high yields and an early glutting of the Sydney market. As a result, it did not pay to pick, and many acres were ploughed in or left for seed.

This experience, no doubt, was responsible for a much decreased area last season, and the crops being poor for the most part, there was always a good demand on the market, and upwards of £50 an acre was made by some growers.

Experiments with peas have been conducted for a number of years, with Mr. G. W. Kelly, Caves Road, Oberon, in co-operation with the Department of Agriculture, with a threefold object, namely:—(1) To ascertain the highest-yielding varieties; (2) To determine the most suitable fertiliser to apply; and (3) to demonstrate the suitability of this legume as a rotation with potatoes.

The trials have been conducted on a grey loam soil of poor quality. The 1924-25 experiments were sown on 5th January, 1925, the previous potato crop not having been harvested until November because of the low prices ruling throughout the winter of 1924. The soil was ploughed and harrowed in December, and was in good order at sowing time. The varieties were sown at the rate of 1¼ bushels per acre, and Yorkshire Hero in the manurial trial at 1½ bushels per acre.

The season was not a favourable one for early sown peas, but the late-sown plots experienced better conditions, although frosts in February and April were severe. The rainfall recorded at Oberon from January until the end of May was 10·60 inches. Several pickings were made, the growth of bush being fairly luxuriant and the setting of pods heavy.

The varieties yielded in the following order:—

1. Yorkshire Hero—94 bushels per acre.
2. Greenfeast—89 bus. 11 lb. per acre.
3. English Defiance—73 bus. 17 lb. per acre.
4. Witham Wonder—72 bushels per acre.
5. Richard Seddon—69 bus. 3 lb. per acre.
6. English Wonder—65 bus. 7 lb. per acre.
7. Sherwood—57 bus. 6 lb. per acre.

These results are consistent with previous seasons' trials, either Greenfeast or Yorkshire Hero invariably giving the highest yields.

Excellent returns were obtained from Yorkshire Hero in the trial with fertilisers. These were as follows:—

1. P1—322 lb. per acre—96 bus. 12 lb. per acre.
2. Superphosphate—280 lb. per acre—94 bus. 14 lb. per acre.
3. M3—364 lb. per acre—93 bus. 24 lb. per acre.
4. M13—364 lb. per acre—92 bus. 16 lb. per acre.
5. P2—322 lb. per acre—91 bus. 17 lb. per acre.
6. P3—448 lb. per acre—81 bus. 9 lb. per acre.
7. P10—364 lb. per acre—79 bus. 2 lb. per acre.
8. No manure—65 bus. 25 lb. per acre.

The increases due to fertiliser range from 13 bus. 5 lb. with P10 up to 30 bus. 15 lb. with P1. The latter, which is composed of 10 parts superphosphate and 1½ lb. of ammonia, has always shown to advantage. The manures containing sulphate of potash, namely, P2, P3, and P10, have not yielded so well, and indicate that, in this locality, the addition of potash is unnecessary.

That the rotation adopted of (1) peas and (2) potatoes is a good one is evidenced by the excellent returns secured each year from both crops, particularly as the soil is a poor-quality, grey-coloured loam. The leguminous crop is of special value to the potato crop in this rotation, and from the experience at Oberon the adoption of this rotation more generally in potato-producing parts of the central west can be confidently recommended.

Not More Cows, but Better.

Twenty cents out of every dollar that the average American family spends for food goes for dairy products, states Dr. C. W. Larson, United States Bureau of Dairying. From the standpoint of the amount of nourishment obtained per dollar spent, dairy products are the cheapest food. But human population is increasing at a much faster rate than cow population. At the same time per capita consumption of milk is growing as people learn more of the health-giving qualities of dairy products. What is needed most, however, is not more cows, but better cows.

When Combining Sprays.

In order to save time and labour it is sometimes desirable to apply two classes of insecticide combined, or one or two classes of insecticide combined with a fungicide. Many such combinations give as good results as when the sprays are applied separately. Care must be taken, however, that sprays are not used, the ingredients of which, when mixed, change in some physical or chemical respect to a sufficient extent to destroy the efficiency of the spray or to cause damage to the trees.

A pamphlet discussing this question and indicating by diagram and table compatible and incompatible sprays is obtainable free from the Department. It is one of the numerous departmental publications on orchard subjects. A complete list is available on application to the Under Secretary and Director, Department of Agriculture, Bridge-street, Sydney.

A Suggested Relation Between the Water Requirement of Crops and their Value in the Rotation.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.*

THE thinking farmer is beginning to give more attention in recent years to rotation or change of crops, and in deciding which crop he shall grow he is influenced not only by the use or value of the change crop, but also by its effect on the subsequent main crop on which he largely relies. It is the intention of this paper merely to draw attention to what appears to be some relation between a factor which is already known, viz., the water required by the crop to produce a given quantity of dry matter and its subsequent effect on the yield of the succeeding crop. It is not intended to be at all dogmatic about this relation, as there is yet incomplete evidence to bring forward in its favour, but the small amount of evidence so far available makes it appear that some relation of the kind does exist. Whether it will be found that a definite rule can be adopted with regard to this point will depend on further experiments and observations. So far the available evidence is mostly based on observations and not on any data from definite experiments, but it is possible that, when attention has been drawn to the apparent relation, many experimenters will be able to bring forward actual data in support thereof.

Briefly, the relation that appears to exist is that crops which have a high water requirement have a comparatively beneficial effect on the subsequent crop, and *vice versa*, that crops which have a relatively low water requirement have a comparatively detrimental effect on the succeeding crop. In other words, the higher the water requirement of the change crop used in the rotation the better the yield of the subsequent main crop which immediately follows it. There are, of course, other factors which may enter into this which may have a disturbing effect on this suggested rule, such as the method of harvesting or utilising the change crop, but these other things being equal it is thought that the rule may largely apply.

In the coastal districts of New South Wales and in many other parts of this and other countries, where maize and sorghum are grown, it is a matter of universal acknowledgment that the following maize crop succeeds better after maize than after sorghum. The idea prevails that sorghum is " hard on the land," that it takes more plant-food from the soil than maize. It is a fact that maize has a relatively higher water requirement than sorghum, and it is observed that sorghum has the effect of drying out the ground more

* Paper read at meeting of Australasian Association for the Advancement of Science, Adelaide, September, 1924.

than maize (which facts are somewhat related). The farmer's idea that sorghum is "hard on the land" has more than a germ of truth in it, but it is not perhaps so much that the soil is depleted more of plant-food by sorghum than maize, but that sorghum has the power of growing when the moisture content of the soil is lower than is possible in the case of maize (that is, has a lower wilting co-efficient), and hence has the effect of drying-out the soil more and rendering it of somewhat worse physical condition. It is this condition which is really observed by the farmer, for he finds it more difficult to work such land up into a suitable seed-bed for the next crop. Yet it may also be the case that sorghum, being able to grow on less moisture in the soil than maize, does have some effect in depleting the available plant-food of the soil more than maize, and so both these influences work to the comparative disadvantage of the succeeding crop.

Whatever may be the reason, it is put forward that the water requirement of the crop is closely related to these effects, and it is interesting to note that sorghum has always been recorded as having a lower water requirement than maize.

This fact started the train of thought that possibly the same relation might be found for other crops for which the water requirement is known and which have a recognised effect, beneficial or otherwise comparatively, on the succeeding crop as determined either by observation or actual data. In comparing crops in this way it would, of course, be totally unfair to compare winter and summer crops in the effect on the subsequent crop, largely because of the difference in time which follows the harvesting of such crops and the difference in length of fallow and the different amount of moisture which can be stored in the soil, and other differences which upset comparison. Let us, however, give some further instances.

Pumpkins are regarded by experienced farmers in the coastal districts as the best preparatory crop for lucerne, being much better than maize or sorghum. From figures determined in several investigations it has been found that the water requirement of a pumpkin crop is practically double that of maize or sorghum.

Summer leguminous crops, such as cowpeas, soybeans, peanuts, have far higher water requirements than maize or sorghum, and there is no doubt about their superior influence on the yield of the following maize crop as compared with maize or sorghum. These effects may, however, be largely due to their different utilisation in part and also to their ability to maintain or increase the nitrogen content of the soil, but despite this advantage for peanuts it is interesting to note that sunflowers have a higher requirement, and that in an experiment conducted in Rhodesia, maize after sunflowers gave a yield of 1,955 lb. per acre, whilst maize after peanuts yielded only 1,196 lb. per acre.

Winter leguminous crops, such as vetches and field peas, would be expected to be (as they are) far more beneficial to the subsequent crop than winter cereals, such as wheat, oats, barley, &c., because of their nitrogen-gathering

properties, quite apart from the fact of their generally much higher water requirements. Of these legumes themselves the water required to produce a ton of dry matter is higher in the case of vetches than of field peas, and coastal farmers in New South Wales swear by the greater beneficial effect of vetches on the subsequent crop even though they may not produce as heavy a crop as field peas.

Of the cereals, oats have a higher water requirement than wheat, and though both crops are regarded as comparatively deleterious to the succeeding crop of maize or sorghum in coastal districts, wheat has by far the worse reputation of the two.

These few examples indicate that there may be some relation between the relative water requirement of different crops and their effect in the rotation on subsequent crops. The valuable work done at Akron, Colorado, in America, and also that done under Australian conditions by Dr. Richardson at Werribee, in determining the water requirements of plants, should serve as an excellent basis for further determinations on these lines, which may prove of value in indicating to farmers the best choice for a preparatory or change crop for the main crop in this rotation.

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[1] *Rhodesian Agricultural Journal,* October, 1916.
[2] *Journal of Agricultural Research,* vol. 3, No. 1.

The Care of Eggs in the Home.

Eggs should be kept in the coolest, cleanest, driest place in the house, where the temperature will remain steady, states a pamphlet of the Canadian Department of Agriculture. Eggs will absorb odours of any kind very readily and should never be placed near fish, cheese, onions, or kerosene. If a case or crate containing eggs is placed in a cellar or basement, the container should be placed either on a shelf or on supports of some kind which will ensure that the container is not actually touching the floor, in order to guard against mould or must.

A Well-tried Weed-killer.

The drainage of yards and roads about the homestead is often interfered with by the growth of grass and weeds blocking water-tables and culverts. A liquid weed-killer sprayed on with a watering can while the growth is short will make an effective clearance. A well tried recipe is as follows:—Place 1 lb. arsenic and 2 lb. caustic soda in a kerosene tin nearly full of water. Leave it to stand for a few days, and the arsenic will be dissolved, when the mixture may be diluted to 20 or 40 gallons, according to the nature of the weeds to be destroyed. Needless to say, this mixture is poisonous and should be kept in a safe place, as also the utensils used, as they can never be satisfactorily washed and made safe for other purposes again.—W. C. Hyde, in the *New Zealand Journal of Agriculture.*

Pure Seed.

[JANUARY, 1926.]

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunaer.

Wheat :—	
Bena	Manager, Experiment Farm, Temora.
	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
Binya	Manager, Experiment Farm, Condobolin.
Canberra...	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Condobolin.
	Chaffey Bros., Nemingha.
	J. Watson, Merriwagga.
Clarendon	L. Jarvis, "Ferndale," Gilgandra.
	Manager, Experiment Farm, Glen Innes.
Federation	Manager, Experiment Farm, Temora.
	Manager, Wagga Experiment Farm, Bomen.
Firbank	Manager, Experiment Farm, Condobolin.
	Manager, Wagga Experiment Farm, Bowen.
Florence	Manager, Experiment Farm, Glen Innes
Genoa	Manager, Experiment Farm, Glen Innes
Gresley	Manager, Experiment Farm, Condobolin.
Hard Federation	Manager, Experiment Farm, Temora.
	Manager, Wagga Experiment Farm, Bowen.
	Manager, Experiment Farm, Cowra.
Major	Manager, Wagga Experiment Farm, Bomen.
Marshall's No. 3	Manager, Wagga Experiment Farm, Bomen.
Wandilla	Manager, Experiment Farm, Temora.
	Manager, Wagga Experiment Farm, Bowon.
	Manager, Experiment Farm, Cowra.
Waratah...	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
Yandilla King	Manager, Experiment Farm, Temora.
	Manager, Wagga Experiment Farm, Bomen.
Zealand	Manager, Wagga Experiment Farm, Bomen.
Oats :—	
Algerian	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Glen Innes.
Belar	Manager, Experiment Farm, Temora.
Lachlan...	Manager, Experiment Farm, Temora.
Mulga	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Glen Innes.
Myall	Manager, Experiment Farm, Temora.
Barley :—	
Cape	Manager, Experiment Farm, Bathurst.
Pryor	Manager, Wagga Experiment Farm, Bomen.
Trabut	Manager, Wagga Experiment Farm, Bomen.
Grasses :—	
Hooker's Fescue	Manager, Experiment Farm, Glen Innes.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

JANUARY.

JAMES HADLINGTON, Poultry Expert.

NOTWITHSTANDING the unpromising outlook for the poultry industry in the closing months of the year, it is almost certain that 1925 will be looked back upon as somewhat of a landmark in the progress of the poultry industry.

During the past season there has been a large increase in the number of chickens raised. Twenty-five per cent. more eggs have been exported, and reports indicate that good prices have been realised. A fair-sized consignment of " spring chickens " has been despatched to London, and a poultry-farmers' association has been formed with objects in view, which, if wise councils prevail and poultry-farmers are alive to their own interests, should have a far-reaching influence in stabilising the industry.

With regard to the export of eggs to London, it would appear that our Sydney brands of eggs, consigned from the Producers' Distributing Society, have made such a reputation that they are now regarded as second to none imported into Great Britain. Inquiries are being made through other channels as to the volume of eggs available for export, and we are assured by one inquirer that the only difficulty is that there is not a very much greater supply to operate upon. This bears out the opinion expressed in these notes some few years ago that the reason why we were not exporting on a much larger scale was the fact that we had so small a surplus available for export. This is now definitely known to be the case. The position is that each of the other States (except perhaps Tasmania) is exporting more or less, and signs are not wanting that the bugbear of interstate competition as far as new laid eggs are concerned will soon be a thing of the past. There is no reason why the flush season of production in 1926 should not witness record shipments of eggs to London. Notwithstanding the troubles of the past two or three months, therefore, the future is full of promise to our industry.

The Export of Spring Chickens.

Following upon the small trial consignment of 600 spring chickens, made by the Department from its two poultry sections last year, a bigger effort has been made this year by poultry-farmers themselves, the Department participating to the extent of 250. Altogether some 2,500 chickens have been forwarded to London by the s.s. " Ferndale," which left on 21st December. In this consignment there are grades of chickens from 1 lb. to 2½ lb. weight, and the numbers in the cases vary from sixteen to thirty. The idea is still to regard these as in the nature of an experiment. Not only are there various weights and numbers to the case, but two sizes of cases have been used in which the chickens are differently packed, some being " bled,"

while the bulk were sent as in the initial shipment. The consignment was got together and packed under somewhat improvised conditions at the Producers' Distributing Society's Parramatta depot, portion of which was very generously loaned to the committee handling the consignment. The intention was to export 4,000 birds, and to commence dressing from 2nd November, but owing to the uncertainty of securing refrigerating space that date could not be adhered to, and it was not until a month later that a start was made. In the meantime many of the chickens promised were, of course, getting too large for this purpose, and the owners marketed them in the ordinary way. Export could have been carried on to a later date, but for the fact that it was desired to get the consignments away early in December.

It would, of course, be possible to ship as late as the middle of January, but it was desired to get more definite experience with an early consignment. It was noticeable that for some reason not quite apparent griller chickens have been making better prices (at any rate to some consignors) during the period over which these operations have been carried out than was expected, particularly in view of the increased numbers available. On the other hand, some consignors who participated in this consignment reported having received ridiculously low prices for a similar class of birds marketed in Sydney. A full report as to the export consignment will be published in these notes after returns have been received from London.

Reminders for the Month.

The cost of feeding hens at present, even where the food is being purchased wholesale, is around 2½d. per hen per week, and to many small poultry-farmers who purchase their feed in small lots it will be nearer 3d. per week. This being the case, it will be most unwise to keep "boarders," and no time should be lost in culling out the second year hens that have ceased to lay, or even the poor layers in their first year. These are generally the ones that go into moult early, and they can be recognised from now onward. The old idea that the hen which moults early will come on to lay early is quite a fallacy. It is well known that it is the late moulter that is the best layer. A hen that stops laying and moults in December or January is invariably a poor layer.

But here comes the crucial point. Many flocks are so badly managed, either in feeding and housing or both, that very little egg production is obtained from them after the flush period of production is past. The idea, too, that this poor laying ability is entirely due to strain is a fallacy we shall do well to get rid of. Allowing that some strains are better that others as layers, we are not aware of the existence of a "strain" of White Leghorns, Orpingtons or Langshans, for instance, which is not good enough, or would not produce an average of twelve dozen eggs per annum if well managed. At the same time, we are aware of many flocks which do not produce anything approaching that figure, but which are capable of that average per hen if they were properly fed and managed. The word "managed," of course, includes breeding, rearing, housing, culling, and the general conduct of the

farm, and, of course, with regard to strain, it is presumed that stamina and physique have been maintained. Failure in this respect would come under the head of bad management.

The average expectation of laying for this month, taking a farm of equal proportions of first and second year hens, and without the aid of pullets coming on to lay, is thirteen eggs per hen, and if that average is not forthcoming there is something wrong which the attendant will do well to concentrate upon until the trouble is located. It may be in the number of birds that should have been culled or in other ways, but there is something to find out and remedy. Observations over a large number of farms go to show that nothing like the egg production is generally obtained in November, December, and January that should be the case.

To keep up egg production in those months (and for that matter later, if to a lesser extent) is where skilled management tells. To illustrate this point we can take experiment work as an example of what is necessary on the part of the farmer. Whatever experiments are being carried out by the Department, the condition of the different units comprising them is closely noted from month to month. For example, in the feeding tests carried out at Hawkesbury Agricultural College to test the effect of different percentages of meat meal, it was a most noticeable feature that the 160 hens comprising four units of forty each, with a variation of ration starting with no meat meal, followed by 2½ per cent., 5 per cent., and 7½ per cent., all appeared to be in normal health and condition until November. In that month there were distinct signs of both the no-meat and the 2½ per cent. groups failing in condition, while the groups receiving 5 per cent. and over were keeping in good form. Thereafter came a distinct falling off in production from the two first mentioned units. Here was a case in which the class of feeding was undoubtedly at fault, and the result was seen in the failure of the birds to maintain their condition. On an ordinary farm this would have suggested that 50 per cent. of the birds involved require culling. What they really required was adequate feeding. The results of these experiments have already been published, but this is only one instance of how production may be lowered. There are many ways as already indicated in which the same result might be brought about.

What has been said with regard to hens applies equally, in so far as management is concerned, to pullets which are coming on to lay. As is well known to experienced farmers, pullets of the previous season's hatching are most tricky and erratic in the way they come on to lay and later break up into a partial moult. The farmer who secures anything like consistent laying from his pullets during the summer and autumn months is either a skilful manager or is particularly fortunate in having hit upon good practice with an element of luck attached.

However, this view notwithstanding, a great deal of the so-called luck—good or bad—is in reality bound up with the management of the birds. Feed and how it is fed are important factors, but faulty housing is probably responsible

for more trouble with pullets than anything else. The most prominent faults in housing are : (*a*) placing too many immature pullets in one house, (*b*) placing the perches too close, and (*c*) insufficient ventilation. It is the habit of pullets to crowd more closely on the perches than is the case with hens. Short perches will, to some extent, alleviate this trouble, but here again the short perches that one sees placed about 12 to 15 inches apart over dropping boards are generally fatal to good results. If farmers would visit their roosting houses on some hot night and see what is happening, taking into consideration the heat of the bodies so packed together on the perches, they would get a lesson of no small importance. Spreading the birds out both by widening the distance apart of the perches and cutting the length to 12 feet will do much to prevent " breaking up," as it is known.

Protect Pullets from Chicken-pox.

A reminder is seasonable that the protective measures against chicken-pox should be commenced early next month.

A tablespoonful of flowers of sulphur for the equivalent of every fifty adult birds should be given in the morning mash *every third day for a period of three weeks.* Then this should be stopped, and for the next three weeks Epsom salts should be added every third day to the drinking water at the rate of one ounce to the gallon. At the end of the three weeks stop the Epsom salts and return to the flowers of sulphur in the mash, and continue alternating the treatment until the period is passed over which chicken-pox is seasonable.

It is emphasised that the full protective benefit of the flowers of sulphur will not be obtained unless the advice given is carried out in its entirety and to the letter, but in order that no misunderstanding may arise it may be stated in terms of weight for weight. To every 7 or 8 lb. of the mash, whether wet or dry, one ounce of sulphur should be mixed, commencing well ahead of the time when the disease is liable to appear, and continuing till the season is over, which means that it is advisable to commence the sulphur treatment in this State in the first week in January and to continue it through the summer till about April.

In using dry mash the sulphur should only be given every third day the same as for the wet mash.

A Reminder to Pastoralists.

Some mortality has occurred during November following the dipping of sheep which were badly affected by grass seed, and in another case death resulted when sheep were travelled immediately before and after dipping. In order to avoid trouble of this nature it should be recognised that sheep which are dipped when heated as a result of travelling, or which are put on to the road immediately after coming out of the dip in hot weather, are more susceptible to the effects of arsenic.—Max Henry, Chief Veterinary Surgeon.

Orchard Notes.

January.

W. J. ALLEN and W. LE GAY BRERETON.

THE season since the spring until time of writing has, on the whole, been dry in many fruit districts. It is in such a season that the benefits of thorough cultivation are manifest. Sometimes there is an inclination to slacken off in cultivation when the crops of early fruit have been harvested, but this is a bad policy, as in order to form its fruit buds for the following season, the tree requires plant-food, which it cannot obtain if the soil is dry.

In some districts, especially among apples and pears, where spraying is very constant during spring and early summer, the land gets trampled badly, and really requires a light ploughing to put it in order at this period.

Budding.

Provided the sap is running freely, budding of either nursery stock or old trees can be carried out this month. Where old trees to be worked were cut back at the end of the winter, they should by this time have made plenty of young shoots mature enough to bud into.

The bark of these shoots is not thick, and should offer no difficulty, even to the novice, but it is wise to work more shoots than will ultimately be required for the formation of the new tree, as there is likely to be some loss from heavy winds and other causes. Moreover, with thick limbs, if at least two (more are better) shoots are left (one on the top and one on the bottom side), the sap is kept moving on both sides, and there is no chance of the bark dying away on one side. If both are budded, both resultant shoots should be trained in the one direction, so that if one is lost the other will take its place. Two or three years hence, when the callus has crept well over the edges of the top wound where the original thick limb was cut back, one of the budded shoots can be dispensed with. This leaves a wound, but it is one which will heal over very much more readily than the top wound referred to above.

Where it is desired, old trees that have not been cut back and have no young shoots low down can be budded direct into the old bark. Owing to the thickness of the bark and the pressure it exerts, it is more difficult to slip in the buds and the work is slower. As a rule, the bark on the lower side of limbs, owing to its more shaded position, will lift more easily than that on the upper side. In the following spring when the limbs are cut back to start the buds in the event of a shoot starting on the upper side, it should be checked to prevent it from sapping the shoot from the inserted bud, but it should not be rubbed right off, as it will serve to keep the sap moving on the upper side, and prevent any of the bark dying, as just described. Later, it could also be budded and held as a safeguard in case the shoot from the

bud inserted in the old bark be blown out or otherwise lost; as in the former case the secondary bud could be cut away after the callus has crept well over the edges of the wound where the old thick main limb was cut back.

A bulletin entitles "Budding and Grafting" may be obtained from the Department of Agriculture, price 10d., post free.

Summer Training.

Young trees, or trees that have been worked over the previous year, and which are making very heavy growth, may now need attention.

Any strong shoots that are not required for the formation of the tree and which may sap the required shoots should be topped back. If the required shoots are making very long growth, they may require topping to save them from being broken out or blown too much out of position by heavy winds. In carrying out the latter it is preferable not to go below the young tender part that snaps easily, as cutting this late in the season where the wood has matured at all will sometimes stunt the growth too much.

Re-worked trees will also require watching, so as to check back growths from the old part of the tree, to prevent them from sapping the shoots from the scions.

It is preferable to check rather than rub out altogether these growths, as they shade the bark and keep the sap moving in the old part of the limbs, and also provide foliage to elaborate the sap from the root.

Pests.

In districts where codlin moth is troublesome an extra application of lead arsenate would be advantageous, except on apples and pears that are almost ready for picking. All infested fruit should be regularly collected and destroyed by boiling. It then can be fed to pigs.

If red, brown, or wax scale or white louse are bad on citrus, it may be necessary to treat the trees this month by either spraying or fumigation. If possible, however, it is preferable to wait until later in the season, when the greater part of the eggs have hatched out. If any deciduous trees are found affected with San Jose scale, spraying with resin wash as soon as the fruit is picked is recommended, but this treatment should be followed by a thorough application of lime-sulphur (winter strength) or miscible oil when the trees are dormant in the winter.

Losses During Hay-making.

As a result of tests conducted by the Canadian Department of Agriculture, the following practices are recommended as helping very materially to preserve the original food value of a crop that is being converted into hay:—

1. Get the hay into swaths or cocks before the leaves become dry enough to shatter.
2. In showery weather cut only limited quantities, and get these cocked up as soon as possible.
3. Handle as little and as carefully as circumstances will allow.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society.	Secretary.		Date.
Dapto A. and H. Society	E. G. Coghlan	Jan.	15, 16
Northern Suburbs A. & H. Association (St. Ives)	T. Conway	,,	15, 16
Gosford A. Association	H. G. Parry	,,	22, 23
Kiama A. Society	G. A. Somerville	,,	26, 27
Wollongong A. H. and I. Association	W. J. Cochrane	,,	28, 29, 30
Yanco Irrigation Area A. Society (Leeton)	W. Roseworn	Feb.	9, 10
Mullumbimby A. Society	A. V. E. Overall	,,	10, 11
Shoalhaven A. and H. Association (Nowra)	H. Ranch	,,	11, 12, 13
St. John's Park Agricultural Bureau	A. Bate	,,	12
Tahmoor and Couridjah A. H. and I. Society	E. S. Key	,,	12, 13
Guyra P. A. and H. Association	A. A. Brown	,,	16, 17
Pambula A. H. and P. Society	L. K. Longhurst	,,	17, 18
Wyong A. Association	L. C. Reeves	,,	19, 20
Central Cumberland A. & H. Association (Castle Hill)	H. A. Best	,,	19, 20
Southern New England P. and A. Association (Uralla)	D. G. Evans	,,	23, 24, 25
Newcastle A. H. and I. Association	E. J. Dann	,,	23 to 27
Tenterfield P. A. and M. Association	W. O'Shea	,,	23, 24, 25
Alstonville A. Society	W. J. Dunnet	,,	24, 25
Gunning P. A. and I. Association	G. E. Ardill	,,	25, 26
Tingha	A. J. Dunshea	,,	26, 27
Blacktown A. Society	J. McMurtrie	,,	26, 27
Robertson A. and H. Society	J. F. Rofe	,,	26, 27
Tumut A. and P. Association	T. E. Wilkinson	Mar.	2, 3
Inverell P. and A. Society	W. Maidens	,,	2, 3, 4
Bangalow A. and H. Association	....	,,	3, 4
Hunter River A. and H. Association (West Maitland)	M. A. Brown	,,	3, 4, 5, 6
Wauchope P. A. and H. Society	T. Suters	,,	4, 5
Oberon A. H. and P. Association	F. H Kelly	,,	4, 5
Taralga A. P. and H. Association	W. Jno. Jeffery	,,	4, 5
Adaminaby P. and A. Association	C. E. R. Pryce	,,	4, 5
Berrima A. H. and I. Society (Moss Vale)	W. Holt	,,	4, 5, 6
Nepean A. H. and I. Society (Penrith)	C. H. Fulton	,,	5, 6
Nimmitabel A. and P. Association	R. K. Draper	,,	9, 10
Central New England P. and A Assoc. (Glen Innes)	G. A. Priest	,,	9, 10, 11
Mudgee A P. H. and I. Association	J. H. Shaw	,,	9, 10, 11
Yass P. and A. Association	E. A. Hickey	,,	10, 11
Ulmarra P. and A. Society	....	,,	10, 11
Cobargo A. P. and H. Society	T. Kennelly	,,	10, 11
Manning River A. and H. Association (Taree)	R. Plummer	,,	10, 11, 12
Cessnock A. Association	Bill Brown	,,	11, 12, 13
Crookwell A. P. and H. Society	P. R. Marks	,,	11, 12, 13
Campbelltown A. Society	W. N. Rudd	,,	12, 13
Batlow A. Society	C. S. Gregory	,,	16, 17
Armidale and New England P. and A. Association	A. H. McArthur	,,	16 to 19
Cumnock P. A. and H. Association	K. J. Abernethy	,,	17
Gundagai P. and A. Society	M. W. Holman	,,	17, 18
Macleay A. H. and I. Association (Kempsey)	N. W. Cameron	,,	17, 18, 19
Camden A. H. and I. Society	G. O. Sidman	,,	18, 19, 20
Rydal A. H. and P. Society	V. Bruce Prior	,,	19, 20
Tamworth P. and A. Association	H. G. Read	,,	23, 24, 25
Cooma P. and A. Association	C. J. Walmsley	,,	24, 25

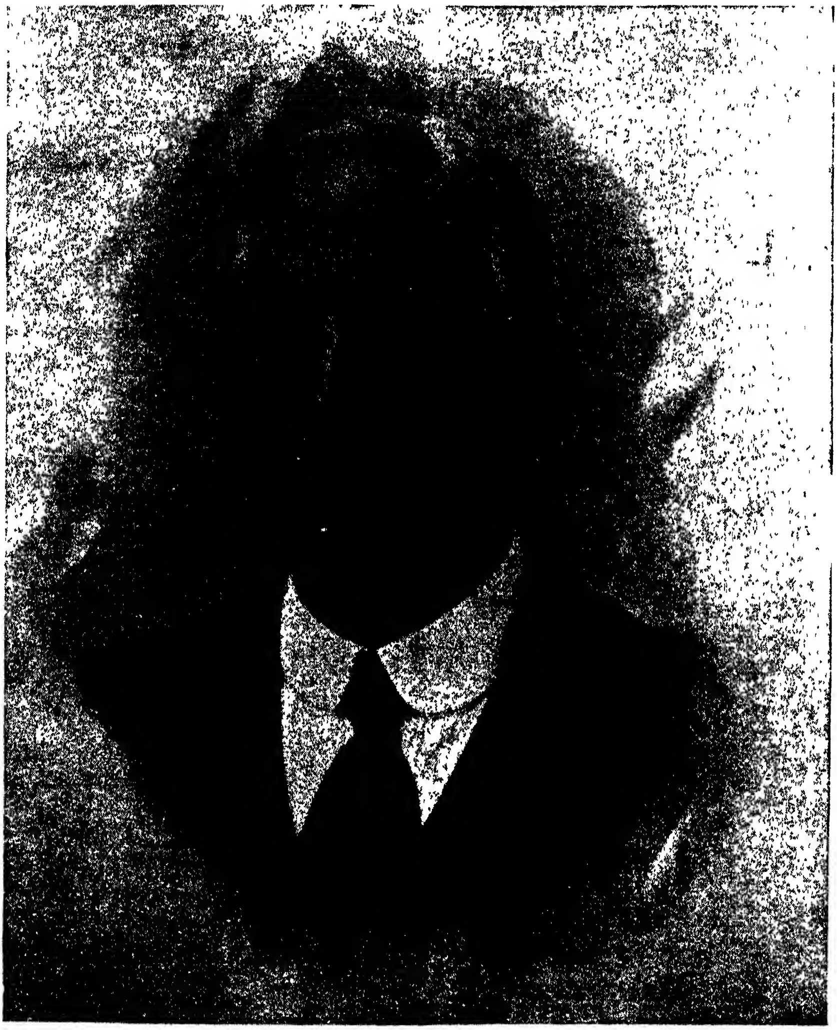
AGRICULTURAL SOCIETIES' SHOWS—*continued.*

Society.	Secretary	Date.	
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	Mar.	24, 25, 26
Warringah Shire and Manly (Brookvale Park)	T. Murray	,,	27
Royal Agricultural Society	G. C. Somerville	,,	29 to Ap. 7
Gloucester A. H. and P. Association	H. Watson	April	14, 15
Orange A. and P. Association	G. L. Williams	,,	20, 21, 22
Upper Manning A. and H. Association (Wingham)	C. Stewart	,,	21, 22
Clarence P. and A. Society (Grafton)	L. C. Lawson	,,	21 to 24
Lower Clarence A. Society (Maclean)	T. B. Notley	,,	28, 29
Dungog A. and H. Association	W. H. Green	,,	28, 29, 30
Richmond River A. H. and P. Society (Casino)	....	May	5, 6, 7
Kyogle P. A. and H. Society	L. Campbell	,,	12, 13
Bonalbo A. and I. Society	W. G. E. Johnston	,,	27, 28
Murrumbidgee P. and A. Association	F. H. Croaker	Aug.	24, 25, 26
Cootamundra P. A. H. and I. Association	W. W. Brunton	,,	31, Sept 1
Grenfell P. A. H. and I. Association	T. Weneham	,,	31, ,, 1
Young P. A. H. and I. Association	T. A. Tester	Sept.	7, 8, 9
Lake Cargelligo P. A. H. and I. Association	J Costella	,,	8
Ganmain A. and P. Association	C. C. Henderson	,,	14, 15
West Wyalong P. A. H. and I Association	T. A. Smith	,,	14, 15, 16
Cowra P. A. H. and I. Association	E. Todhunter	,,	14, 15
Murrumburrah P. A. H. and I. Association	W. Worner	,,	21, 22
Canowindra P. A. H. and I. Association	J. Rhue	,,	21, 22
Temora P. A H. and I. Association	A D. Ness	,,	21, 22, 23
Boorowa P. A. H. and I. Association	W. Thompson	,,	22, 23
Barellan P. A. H. and I. Association	J. Doherty	,,	29
Barmedman P. A, H. and I. Association	W. Pemberthy	,,	29
Hillston P. A. H. and I Association	J. Pevers	Oct.	1
Ardlethan P. A. H. and I. Association	R. L. Neill	,,	6
Narrandera P. and A. Association	W. H. Canton	,,	12, 13
Ariah Park P. A. H. and I. Association	J. McInness	,,	13
Griffith P. A. H. and I. Association	M. E. Sellin	,,	19, 20

An American Plan for Dealing with Insect Pests.

Details are made available by the Federal Department of Markets and Migration, Melbourne, of a method employed by the United States Department of Agriculture of "baiting" insect pests that they may be the more conveniently killed. The plan apparently is to put out bait which will draw them to a common centre, and then to apply a toxic spray.

The latest attractive agent is known as geraniol, and it has been employed successfully in fighting the Japanese beetle which has invaded New Jersey and other portions of the country. Its utility in this connection was demonstrated during the course of an observation tour conducted in New Jersey recently, when a party consisting of a number of orchardists and entomologists especially interested in the work of the Japanese Beetle Laboratory of the Bureau of Entomology visited about a hundred acres of demonstration orchards (peaches, apples, cherries and grapes), in one of which orchards the demonstration was held. The attractor was used to draw the beetles into a limited area as described, where they were destroyed with a spray consisting of oleoresin of pyrethrum and soap. This has been developed at the laboratory during the past season and has given remarkably good results, according to the Department.



MR. GEORGE VALDER,

UNDER SECRETARY AND DIRECTOR OF AGRICULTURE, 1913-1926.

Agricultural Gazette of New South Wales.

Mr. George Valder.

AN APPRECIATION.

THE officers of the Department of Agriculture have already expressed to Mr. George Valder their personal appreciation of his administration of the Department during the thirteen years he has been Under Secretary and Director, but they consider it appropriate also to accept the opportunity of recording here their high esteem of his many and notable services to the cause of progressive agriculture in New South Wales.

The period during which Mr. Valder has been permanent head of the Department has been one of marked progress and enlargement. Varied as were the activities thirteen years ago, they are much more so to-day. Mr. Valder's youthful association with agriculture was on the practical side, and his sympathies with the farmer have been deep and unvarying, but he has had also a keen appreciation for the importance and value of scientific research, and to the balance in which he held these two essential aspects of primary production is largely due the substantial advances of the last decade.

Mr. Valder joined the Department of Agriculture in 1890, being one of the first officers appointed at the initiation of the Department. His rise in the service was uninterrupted, and in each capacity he gave evidence of that devotion to farming interests that has ever marked him. As Manager of Wagga Experiment Farm, Principal of Hawkesbury Agricultural College, and representative of New South Wales trade interests in South Africa after the Boer War, he was uniformly successful.

His most distinguished service, however, began when he was appointed Chief Inspector of Agriculture in 1907. It was then that he initiated the system of farmers' experiment plots, which has had such a far-reaching influence on the farming methods of the State. The full significance of that system will perhaps never be told, but what has been achieved in the demonstration of the value of new varieties and better methods has left an indelible impress upon cropping practices in New South Wales. The elasticity and adaptability of the system is manifested daily as its application is developed in the hands of an increasing field staff. Another achievement of that historic period was the establishment of the Agricultural Bureau, by which the Department's contact with farmers has become closer, and circles of local interest in progressive methods generally have come into existence.

From Chief Inspector, Mr. Valder was advanced to Superintendent of Agriculture in 1911, having there an opportunity of systematising and co-ordinating the work of the various experiment farms and stations.

The final move upward took place two years later, when Mr. Valder was appointed Under Secretary and Director. To the services rendered in that capacity to the cause of progressive agriculture we are nearer, and it is therefore more difficult to estimate their relative importance, but they have been innumerable, and the soundness of the policy laid down on a score of matters is continually becoming apparent.

Into his retirement Mr. Valder is followed by the good wishes and regard of his fellow officers, and, indeed, of all who are interested in the advancement of primary industries in this State.

Importation of Stock from the United Kingdom.

Although importation into Australia of cattle, sheep, swine, and goats from Great Britain or Ireland is at present prohibited on account of the risk of introducing foot and mouth disease, it has been decided to permit the importation for the present of such stock from Scotland, providing the vessels do not call at any port in the United Kingdom other than in Scotland, that country having remained free from the disease.—Max Henry, Chief Veterinary Surgeon.

Borax Treatment of Lemons for Store.

Some evidence of the efficacy of the borax treatment for the prevention of blue mould of lemons in store was afforded by an experiment conducted by the Wyong packing house.

On 20th November 2 bushels of lemons were picked (pulled) and were at once dipped in a 5 per cent. solution of borax at 115 deg. Fah. for five minutes. They were then placed in unpapered old gin cases and stored in an ordinary shed alongside six cases of lemons picked from the same trees by the same grower, but untreated.

On inspection about five days later from eight to fifteen lemons were affected with blue mould in each of the untreated cases, but only one lemon was "mouldy" in the treated fruit, and that was due to a puncture by a protruding nail in the case. The untreated lemons were then sold, as they showed no keeping qualities, but on 24th December the borax treated lemons were still in excellent condition and were curing splendidly—having changed from their green colour to a light yellow.

Great possibilities appear to exist for borax as a steriliser, as not only is blue mould apparently defeated, but the oil cells in the rind seem to be filled with the chemical and to retain their firm or turgid condition much longer.—R. J. Benton, Fruit Instructor.

Championship Field Wheat Competitions.

The Judges' Reports.

THE RIVERINA DIVISION.

H. C. STENING, H.D.A., Manager, Temora Experiment Farm.

The district agricultural societies which conducted local competitions were Albury, Berrigan, Coolamon, Corowa, Finley, Henty, Lockhart, Narrandera, Oaklands, Wagga, and Yanco, and these covered practically the whole of the wheat-growing areas of the Riverina division. Owing to the lack of rain in the spring, the crops ripened earlier than is usual, and at Yanco and Narrandera the first-prize crop of the local competitions had been harvested prior to my visit to inspect them. At Yanco the crop which gained second place in the local competition was submitted and judged, but at Narrandera it was found that the crops occupying the four premier positions in the district competition had already been harvested before my arrival, and this district was thus deprived of its chance of championship honours.

The judging was commenced at Leeton on 30th November, and was completed at Henty on 4th December.

Conditions during the wheat-growing season cannot be regarded as very favourable, the effective rainfall for the period April to October being below average in most districts, varying from 8·69 inches at Berrigan to 13·29 inches at Henty, representing 3·25 and 1·56 inches respectively below the averages for the period. The total amount of the rainfall would have been ample for very prolific yields had it been better distributed, but the greater portion of the total rain fell during the seeding month of May, as much as 576 points being recorded during this month at Coolamon, while all the registrations during the remaining months of the period were below the average. The driest period was the important spring months of September and October, when there was a deficiency of about 2 inches.

Under such conditions it is only by the adoption of the best methods that profitable yields can be produced, and it was gratifying to find competing for the championship crops which were estimated to exceed yields of 30 bushels per acre.

The prize-winners were:—

Mr. C. W. Moll, "Elderslie," Gerogery (Albury Society)	1
Mr. R. Menzies, "Craig Gowan," Rannock (Coolamon Society)	2
Mr. E. Douglas, "Pinelea," Walla Walla (Henty Society)	3

The championship was won by a fairly dense, well-headed, even crop of the Turvey variety, which was estimated to yield 37 bushels per acre and was well up to the standard of the best crops in very favourable seasons. Points were lost for the presence of saffron thistle, black oats, and an odd barley plant in the crop, and for infection of flag smut and loose smut.

Judging by the rainfall records at Walla Walla, which is about 8 miles from the crop, the season appears not to have been quite so adverse as in other parts of the Riverina. May rains were not excessive, and the rains during the spring months were rather more generous, although still much below normal. Still the excellence of Mr. Moll's crop was outstanding in comparison with all other crops seen in his district or throughout the Riverina division, and it was a tribute to the intelligent cultural methods adopted.

The land was fallowed in August, 4 inches deep, with a mouldboard plough. The fallow was harrowed in September, and scarified in October and January after rain, harrowed in February, scarified and harrowed in March, and scarified before sowing; thus between ploughing and sowing the fallow received seven cultivations. Graded seed treated with formalin was sown in the middle of May at the rate of 85 lb. seed per acre, with an application of 90 lb. of 22 per cent. superphosphate per acre.

The second prize crop, exhibited by Mr. R. Menzies, also consisted of the Turvey variety, the apparent yield of which was judged to be 32 bushels. This was a very clean, even crop, which was, however, somewhat marred by a slight infection of bunt, and the presence of flag smut. The fact that the seed had not been treated with a bunt preventive was responsible for the infection. The land had been fallowed 5 inches deep in July, harrowed after the first rain after ploughing, disced in January, March, and prior to drilling. While the one-way disc cultivator is not considered a satisfactory implement for the preparation of the seed-bed, it is an excellent weed killer, and in this instance its use was imperative in order to eradicate thistles from the fallow, and was largely responsible for the freedom of the crop from weeds. The crop was sown at the end of April with 60 lb. of seed, and 70 lb. of high-grade superphosphate per acre.

The third-prize crop, grown by Mr. Douglas, was a very pure crop of Bomen, the most notable feature of which was its almost entire freedom from weed growth. It was the cleanest crop inspected in the competition, which, as regards half the area, may be accounted for by the fact that it was cropped for the first time. The other half, however, was reported to have produced over six crops previously. The only defect was a slight attack of take-all, which caused a reduction in yield. The ploughing of the fallow was performed with a mouldboard plough in August to a depth of 4 inches; it was harrowed in September and October; scarified in January and February, and also harrowed in February, and was sown with a combine during the third week in May with 62 lb. of graded seed, which had been treated with dry copper carbonate, and manured with 56 lb. of high-grade superphosphate per acre.

Methods of Cultivation.

A review of the total points alloted to the competing crops shows that only three points separated the second-prize crop from the crop placed seventh, which indicates the closeness of the competition. For many years the wheat-growers in the Riverina division have been noted for the high standard of their farming methods, but in recent years a distinct improve-

ment in those methods and their more general adoption cannot fail to have been noticed, and this can be attributed in no small measure to the educational influence of the crop competitions. Little comment can be made on the mode of the preparation of the fallows for the competing crops, except that in a couple of instances it would no doubt have been beneficial to have ploughed the fallow earlier. The winter months, when the rains are usually bountiful and the evaporation of moisture from the soil is low, are the best for the charging of the fallows with moisture, and therefore a fallow ploughed in June or July will usually conserve more moisture and return more satisfactory yields than one ploughed in September. During the latter month, moreover, evaporating agencies become active, and the ploughing is performed at the expense of soil moisture.

Special mention might be made of the judicious cultivation of the fallow by Mr. H. S. Cope, of Berrigan, and as the result of the ten cultivations of the fallow prior to sowing a high yielding crop has been produced under very adverse conditions, which would have scored high honours but for a liberal infestation of wild oats. This was attributed to the fact that prior to fallowing the land had grown two crops of wheat in successive years.

No amount of cultivation is likely to render land badly infested with wild oats clean in one year; it may take several years before their complete eradication can be effected, and much depends upon the incidence of the rainfall for the germination of the seeds, combined with judgment in tillage. Measures that might be briefly mentioned as facilitating eradication are a good stubble burn, succeeded by a cultivation in March; harrowing of the fallow immediately after ploughing in June or July; the use of sheep and the cultivation of the fallow to prevent any oats that have grown on the fallow from seeding; awaiting a good rain to shoot the oat seed prior to the last cultivation before sowing, which cultivation should not be deep; increased seed and superphosphate to stimulate rapid early growth of the crop, thus smothering any oats that may still germinate; the crop should not be fed off.

Varieties and Seeding.

Attention is focussed in these competitions on the most successful varieties. By occupying the two premier positions the Purple Straw selection known as Turvey has excelled. In recent years this variety has become very popular throughout the wheat areas; it is a showy crop, returning good yields of both grain and hay.

Bomen is another variety which performed splendidly by capturing the third and fourth positions in the competition. It is a good dual-purpose variety, and is very resistant to flag smut and rust. Unfortunately it possesses a red grain, and on this account is not recommended. Waratah is another variety which shaped well, and its predominance in the local competitions is indicative of its well-merited popularity.

The quantity of seed sown varied from 55 lb. to 85 lb. per acre, and the rates of application of superphosphate per acre from 56 lb. low grade fertiliser to 90 lb. high grade, which is equivalent to 116 lb. low grade. It was in the production of the champion crop that the highest rates for

seeding and manuring were adopted. Experiments point to a better response to the application of superphosphate by the soils in the more southern portions of the State than in those further north.

In every instance graded seed was used showing that the value of the use of graded seed is fully recognised. So also is the treatment of seed for the prevention of bunt, for all competitors treated their seed except one who makes a practice of pickling the seed each alternate year. There was sufficient bunt present in the crop to prove that the practice must be deprecated. Four competitors adopted the dry copper carbonate method of treating the seed, four used formalin solution, and one only used bluestone solution. Bunt was prevalent in the crop from the bluestone-treated seed, and a trace was also detected in one crop treated with formalin and in one crop treated with copper carbonate. As bunt is a controllable disease a more severe reduction of points was made for its presence than for infection by less easily controlled diseases. The only other diseases which were at all prevalent were flag smut and loose smut. The ravages of the former are each year making greater inroads into the wheat harvest, and earnest attention needs to be directed to measures for keeping the fungus in check.

DETAILS of Awards in Riverina Competition.

Local Society.	Name and Address of Competitor.	Variety.	When Sown.	Seed per acre.	Superphosphate per acre.	Number of Crops.	Apparent Yield, one point for every bus.	Trueness to Type & Purity. Max., 20 pts.	Freedom from Disease. Max., 30 pts.	Evenness. Max., 20 points.	Condition. Max., 10 points.	Cleanliness.*	Total.
1. Albury	C. W. Moll, "Elderslie," Gerogery.	Turvey .	Mid-May.	lb. 85	lb. 90 high grade.	10th	37	18	27	20	10	25	137
2. Coolamon.	R. Menzies, "Craig Cowan," Rannock.	Turvey ..	End April.	60	70 high grade.	8th	32	18½	25	19	10	28½	133
3. Henty	E. Douglas, "Pinelea," Walla Walla.	Bomen ..	Third week May.	62	56 high grade.	Half new land; half over six.	30	19½	27	19	10 ...	26½ max 27	132
4. Corowa	W. Johnson, Ringwood.	Bomen ...	20th to end May.	60	60 high grade.	6th	30	19	29	17*	10	26	131
5. Berrigan	H. S. Cope, "Daisy Plains," Berrigan.	Waratah ...	End April.	75	85 high grade.	Over 6	32	19½	27	19	10	23	130½
5. Wagga	J. M. Dennis, "Farmbo," Tooyal.	Riverina ..	Last week May.	60	65 high grade.	11th	29	18	29½	19	9	26	130½
7. Lockhart.	J. W. Gooden, "Glenroy," Lockhart.	Waratah ...	Second week May.	70	80 high grade.	Over 6	30	19½	28	16	9½	27	130
8. Finley	H. E. Cockayne. "Avondale," Finley.	Waratah ...	Mid-May.	55	50 high grade.	Over 6	25	19½	26	18	10	28	126½
9. Yanco	Maybox Bros., Farm No. 559, Fivebough.	Federation, 88 acres; Waratah, 12 acres.	Mid-April.	70	56 low grade.	3rd	24	19	26	19	9½	22	119½
1. Oaklands.	H. E. Gaffney, "Glenhope," Oaklands.	Turvey ..	First week May.	60	60 high grade.	Over 6	23	16	22	18	10	27	116

* Maximum; first crop, 24 points; second crop, 25 points; third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points

MIDDLE WEST WHEAT AREA.

R. G. MAY, H.D.A., Manager, Bathurst Experiment Farm.

The following ten societies submitted entries for the above championship, viz., Bogan Gate, Cumnock, Dubbo, Forbes, Gilgandra, Narromine, Parkes, Peak Hill, Trundle, and Wellington. Judging commenced on 23rd November at Parkes, and terminated at Cumnock on 26th November. The successful competitors were—

	Points.
1. A. J. Allen, "Eumalga," Dubbo	135½
2. O. Schutt. "Goonahra," Alectown	134½
3. W. Scott, "Deloraine," Bogan Gate	131

There was only a range of 4½ points between the three leading competitors, and of 15 points between the winner and the lowest competitor. The results clearly demonstrate the high standard of the methods of production adopted.

The Leading Crops.

The championship was awarded to an excellent crop of Canberra, which, while not the heaviest yielding entry, was particularly uniform and pure. The land was mouldboard ploughed 4½ inches deep during June and July, 1924, cross springtoothed in January, 1925, cross harrowed again during the same month, and sown with a combine during the third week in May with 50 lb. ungraded Canberra seed treated with copper carbonate, and 60 lb. superphosphate per acre. The seed was saved by Mr. Allen from a previous season's crop, the seed for which had been obtained from a reliable source. No strangers were noticed, though a few departures from type were evident. The crop was very free from disease, only slight traces of which were observed. Freedom from weed growth was also apparent. The crop was the fifth to be grown on the land, and was therefore entitled to a maximum of 28 points for cleanliness. The champion crop was undoubtedly favoured by a heavier rainfall during September, 1925, than other competing entries, but it reflected in no small measure the careful attention to detail necessary for the production of this high quality crop.

The second-prize crop was also an excellent exhibit, reflecting great credit on the grower, Mr. O. Schutt, of Alectown. Much of the crop was densely and well headed, but the apparent yield was reduced by patches affected by drought tip. The land was mouldboard ploughed during June, July, and August, 1924, harrowed in September, springtoothed in January, 1925, "one-wayed" in February and again before seeding. Ungraded Canberra seed, treated with copper carbonate, was hoe-drilled at the rate of 55 lb. per acre during the latter end of May, with 45 lb. superphosphate per acre. The resultant crop lost points for uneveness, but scored well for type and purity. Slight traces of disease were noticed, and weed growth was not much in evidence. The seed for this crop was purchased from a pure seed grower.

The competition for the third place was very close, half a point only separating Mr. W. Scott's and Mr. T. R. Jones' crops. Careful judgment had to be exercised to ensure that the correct award was given. Mr. W. Scott's crop of Canberra, although damaged to a slight extent by weather, was given third place. A hailstorm had given the crop a lean, and shelled out not more than half a bushel of grain per acre. On the score of condition 4 points were deducted. The land was disced 4 inches deep in July, 1924, springtoothed in mid-August, again at the end of September, and one-wayed at the end of February, 1925. Graded Canberra seed obtained from a pure seed source, and treated with copper carbonate, was combine sown early in May at the rate of 60 lb. per acre, with 46 lb. superphosphate per acre. The land was harrowed a few days later and the crop fed off in August. Despite the slight storm damage the crop was even and uniform, with only traces of disease and comparatively free from weed growth.

RAINFALLS on Fallow and Growing Crops.

	Dubbo.	Peak Hill.	Bogan Gate.	Narromine.	Trundle.	Parkes.	Wellington.	Gilgandra.	Cumnock.
1924.					On Fallows.				
June ...	262	249	...	...	...	177	...	...	...
July ...	183	228	173	227	...	221	232	...	...
August ...	153	165	188	85	176	178	139	146	140
September ...	434	377	294	326	292	372	350	360	545
October ...	188	187	143	104	133	150	204	243	118
November ..	748	579	535	593	446	365	681	718	490
December ..	38	155	258	44	191	192	51	15	164
1925.									
January ..	396	457	241	288	252	319	249	95	245
February ...	108	223	223	98	265	300	142	234	138
March ...	108	110	130	70	120	73	90	138	170
April ...	13	12	32	13	10	11	10	...	17
May ...	100	79	100	58	...	...	...	188	252
Totals ...	27·31	28·21	23·17	19·06	18·85	23·58	21·48	21·37	22·79
					On Growing Crops.				
May ...	147	128	145	187	256	205	277	...	...
June ...	442	607	573	728	503	548	265	183	599
July ...	167	141	146	174	117	108	170	118	178
August ...	139	102	165	80	117	116	138	80	139
September ...	136	37	11	76	36	22	50	15	21
October ...	68	48	26	50	13	59	89	no value	199
November ...	...	...	...	...	...	...	...	...	211
Totals ...	10·99	10·63	10·66	12·95	10·42	10·58	9·89	3·96	13·47

Notes on the Season.

The rainfalls on the fallows ranged from 18·85 inches at Trundle to 28·21 inches at Peak Hill, and were much above the average rainfalls for the districts. The effective rainfalls on the growing crops ranged from

3·96 inches at Armatree in the Gilgandra district to 13·47 inches at Cumnock. September and October rainfalls in practically every district were low, causing a proportion of tip wither in some of the crops submitted, and it speaks well for the high standard of the cultivation methods adopted that the crops matured and filled their grain so well.

The results obtained from the practice of proper fallowing have been so pronounced during the present season that a considerable increase in the practice of fallowing should result in the future. The winter rains in some cases caused flagginess of the crops; two crops were fed off in August.

Methods of Cultivation.

All crops entered in the competition were grown on fallowed land. The season experienced would prohibit a crop on unfallowed land from approaching championship condition, and from this aspect the results likely to accrue from the Royal Agricultural Society's competitions are most promising. The profitable practice of combining sheep farming with wheat growing gives evidence of its value in the clean condition of the crop. In every case sheep were grazed on the fallows and the land suitably cultivated. The amount of cultivation necessary to keep the land in proper condition is governed largely by the type of soil to be worked, and in this respect discretion had to be exercised. Sowings were made from late April till early June, the rate of seeding ranging from 45 lb. to 63 lb. seed per acre. Superphosphate was applied at from 40 lb. to 60 lb. per acre, except at Narromine and Wellington, where no fertiliser was used. The value of the application of superphosphate to wheat crops is well-known, and the adoption of a practice of combining a suitable rate of seeding with a definite quantity of superphosphate would undoubtedly return more profitable and consistent results where this practice is not already followed.

Varieties.

The varieties of wheat chosen by the competitors were confined principally to standard sorts, the exception being at Cumnock, where a Tasmanian variety, Braemar Velvet, was grown. This variety has a thick felt of white hairs on the glumes, rather long tip awns, an open head, and is reputed to be disease liable. Before putting large areas under a new variety for cropping purposes, it is advisable that it be tested on a small area against standard varieties for its suitability to the district and climate.

Canberra, the Departmental hybrid between Federation and Volga barley, was chosen by five entrants, the remaining varieties being Yandilla King, Soft Federation, Hard Federation, Gresley, and Braemar Velvet. Canberra gained the four leading places and the seventh, while Soft Federation was placed fifth. It is gratifying to notice the attention paid by the competitors to type and purity. The increasing capital values of the land, the higher costs of production, &c., necessitate the utmost value being obtained from the land. This can only be secured by adopting farm practices which have been definitely proved to produce the highest average returns over a range of seasons.

Disease.

The amount of disease present in the crops judged was almost negligible. Traces of bunt, flag smut, take-all, and foot-rot were evident practically in every crop. Loose smut was more general. Bunt is the only disease for which direct treatment is possible. The dry treatment with copper carbonate was followed by eight competitors, and the wet bluestone method by the balance. A risk was taken by one competitor in sowing a portion of his crop with untreated seed. Flag smut, take-all, and foot-rot appear to have been kept well in check by satisfactory cultivation methods, clean fallows tending to starve these diseases out of the soil. The practice of treating the seed with dry copper carbonate has been widely adopted by farmers generally as a treatment possessing many advantages over the wet bluestone or formalin treatments.

DETAILS of Awards in Middle West Competition.

Society.	Competitor.	Variety.	When Sown.	Rate of Seeding per acre.	Superphosphate per acre.	Number of Crop.	Apparent Yield (one point for every bushel).	Trueness to Type and Purity. Max., 20 points.	Freedom from Disease. Max., 30 points.	Evenness. Max., 20 points.	Condition. Max., 10 points.	Cleanliness.*	Total.
				lb.	lb.								
Dubbo ...	A. J. Allen, "Eumalga," Dubbo.	Canberra ...	Late May	50	60	6th	32	19½	28	19½	9½	27	135½
Peak Hill ...	O. Schutt, "Goonahra," Alectown.	Canberra ...	Mid-May to end of May.	55	45	14th	31	19½	28½	18	10	27½	134½
Bogan Gate	W. Scott, "Deloraine," Bogan Gate.	Canberra ...	May ...	60	56	8th	30	19	28½	19	6	28½	131
Forbes ..	T. R. Jones, "Birdwood," Forbes.	Canberra ...	Early May	60	46	20th	30	19	26	19	10	26½	130½
Narromine	Barry O'Neill, "Baringah," Narromine.	Soft Federation.	Mid-May	49	Nil.	40th	35	13	29	19	8	25	129
Trundle ...	N. A. Percival, "Plevna," Trundle.	Yandilla King.	Early May	45	40	8th	29	14	28	19	10	28	128
Parkes ...	E. J. Johnson, "Iona," Parkes.	Canberra ...	May ...	50	60	11th	27	19	25½	19	9½	25	125
Wellington	T. J. Payne, "Springmount," Suntop.	Hard Federation.	Late April and early May.	63	Nil.	28th	23	18	28½	18½	8	29	125
Gilgandra ...	W. G. Law, "Wattle Park," Armatree.	Gresley ...	End May and early June.	60	50	17th	23	19	28½	16	9½	28½	124½
Cumnock ...	Russell Gibson and Whitty, "Bicton," Cumnock.	Braemar Velvet.	Early June.	50	56	1st	25	18½	29	18½	9½	20	120½

* Maximum: First crop, 24 points; second crop, 25 points; third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points.

It must be highly gratifying to the Royal Agricultural Society to observe the marked increase in interest in the middle west toward the crop competitions, the beneficial results of which are evidenced in the keen attention paid to the different factors necessary to produce crops that can compete

for the championship, such as the working and cultivation of the fallows, the control of weed and fungoid pests, the selection of pure seed of high yielding varieties suited to the locality, the treatment of seed for disease, the adoption of a recognised rate of application of seed and fertiliser, &c.

The past season has produced marked comparisons between crops grown under safe and profitable methods and those grown under haphazard and indifferent methods, and should, with the publicity given to the excellent results obtained by crops in the championship class, exert a strong influence throughout the wheat district towards improved farming methods.

CENTRAL SOUTH-WEST DIVISION.

H. C. STENING, H.D.A., Manager, Temora Experiment Farm.

Compared with a total of ten district agricultural societies, which conducted local crop competitions on the occasion of the previous championship, no fewer than seventeen societies in this division this year organised competitions, showing that substantial progress has been made. These societies were Ariah Park, Barellan, Barmedman, Boorowa, Canowindra, Cargelligo, Cootamundra, Cowra, Eugowra, Grenfell, Hillston, Illabo, Murrumburrah, Quandialla, Temora, West Wyalong, and Young. The winners of each of these local competitions became eligible for competition for the championship of the division.

Owing to the earlier maturity of the crops in the western portion of the division, it was necessary, for judging purposes, to make a division of the area into two sections, and the crops in the western section were judged between 16th and 20th November, and those in the eastern section between 8th and 11th December. The crops at Eugowra and Canowindra were harvested prior to judging, and therefore these districts were not represented in the championship.

Unfavourable conditions prevailed during the wheat-growing season in this division, not for the reason that the total rainfall during the growing period was insufficient, for in most districts the rain during the period April to October exceeded the average, but because these rains were very unfavourably distributed over the period. The season was an example proving that the total rainfall during the growing period is not in itself a satisfactory criterion as to the nature of the season, but that the great importance of a suitable distribution of the rains must always be taken into account.

In most of the districts in the south-eastern portion of the division, the seeding period was regarded as one of the most unfavourable ever experienced. No serviceable rains fell during March, April, and to the 10th of May, while in the remainder of the month of May excessive rains were experienced, totalling over 5 inches and even up to 7·80 inches at Cootamundra. These rains thoroughly saturated the soil, and as they were

followed up by "over-average" rains during the months of June and July, soils, except those of a porous nature or situated in favourable positions on well-drained slopes, were in a waterlogged condition throughout most of the winter. In consequence, the sowing of crops during the best portion of the normal sowing period was hindered and much land intended to be cropped remained unsown or was sown too late under unsatisfactory soil conditions. In the case of crops already sown, portions were completely drowned or the resulting crop was very light. A feature of most of the crops in the competition was that they lacked density owing to the waterlogged condition of the soil being inimical to prolific stooling; this was particularly noticeable in soil depressions, causing the crop to be uneven as regards prolificacy, and rendering the estimation of yields more difficult.

Particularly in the case of late-sown crops, opportune rains in the spring are an essential for the production of high yields, but these were not forthcoming, for, excepting at Cootamundra, the rains during the spring months of August, September, and October were below average, varying from 2·08 inches at Cargelligo to 5·76 inches at Cootamundra.

The Leading Crops.

The prizes are awarded as follows:—

M. Fogarty, Walladilly, Temora	1
O. G. Blayney, Booroota, Grenfell	2
G. Gow, Hughenden, Barellan	3

Mr. Fogarty is to be congratulated on achieving his second success in the championship competitions, for he won the second prize in the previous championship in this division.

The champion crop consisted of 30 acres of Warden and 20 acres of Turvey, over which an average yield of 31 bushels per acre was estimated, Turvey being the heavier yielder of the two varieties. The crop was very free from weeds and scored well under all headings, the presence of a little flag smut and loose smut being the only defect to detract from an excellent crop. It was the eighth crop grown on a fertile loam of alluvial formation, which had been fallowed in July to a depth of 5 inches, harrowed after ploughing, disced in November, and springtoothed before sowing during the second week in April with 60 lb. graded seed treated with bluestone solution, fertilised with 56 to 60 lb. superphosphate per acre.

The second prize went to a very pure and clean crop of Waratah, which was very well headed, but lacked in density, and the yield of which was estimated at 28 bushels. The fallow was ploughed 4½ inches deep in August, scarified at the end of September, disced in February, and sown with the combine from 22nd to 24th May with 52 lb. graded seed per acre, treated with copper carbonate powder; superphosphate was applied at the rate of 60 lb. per acre. The quantity of seed sown was rather light for a moderate stooling variety sown late in May, and with a heavier seeding there is no doubt that the premier distinction would have been achieved.

Details of Awards in the Central South-west Competition.

Society.	Name of Competitor.	Variety.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crop.	Apparent Yield (one point for every bushel).	Trueness to Type and Purity. Max., 20 points.	Freedom from Disease. Max., 30 points.	Evenness. Max., 20 points.	Condition. Max., 10 points.	Cleanliness.*	Total.
				lb.	lb.								
Temora ...	M. Fogarty, "Walladilly," Temora.	Warden, 30 acres; Turvey, 20 acres.	2nd week April.	60	56 low grade.	8th	31	19	28	19	10	29	136
Grenfell ...	O. G. Blayney, "Booroola," Grenfell.	Waratah ...	May 22nd to 24th.	52	60 low grade.	11th	28	19½	29	19	10	29	84½
Barellan ...	G. Gow, "Hughenden," Barellan.	Yandilla King.	20th April.	60	60 low grade.	10th	29	19½	29	18	10	28	133½
Cowra ...	F. C. Rowlands and Sons, "Werribee," Waugoola.	Gresley, 30 ac.; Waratah, 20 ac.	Last week April.	60	60 low grade.	Very old ground.	35½	18½	28	19	9½	22	132½
Illabo ...	Steve Kanaley, "Lynton," Illabo.	Baroota Wonder, 23 ac.; Waratah, 15 ac.; Wandilla, 12 ac.	Last week May.	80† 60‡	90 high grade.	Over 6	30	18½	27½	19½	10	27	132½
Quandialla...	P. G. Coelli, "Bindawalla," Berendebba.	Turvey ...	First week May.	45	100 high grade.	6th	28	19	28	18½	10	28½ (29)	132
Boorowa ...	Clark Bros., "Bonnie Doon," Boorowa.	Waratah, 30 ac.; Federation, 15 ac.; Marshall's No. 3, 5 ac.	Third week April.	60	56 high grade.	Over 6	28	18	29	19	10	27	131
West Wyalong.	H. W. Staniforth, "Yarrandale," Buddigower.	Waratah ...	14 May	80	100 low grade.	Over 6	26	19½	27	19	10	28½	130
Young ...	R. H. Thackeray, "Wootoona," Young.	Waratah, 24 ac.; Canberra, 13 ac.; Hard Federation, 13 ac.	Third week May.	60	56 high grade.	13th	25	19½	29	19½	10	26	129
Barmedman	Maguire and Fehon, "Aorangi," Barmedman.	Canberra ...	Mid-May.	80	80 low grade.	5th	29	18	26	19	10	27½ (28)	129½
Cargelligo ...	P. W. Orr, "Wargambegal," Lake Cargelligo.	Waratah, 18 ac.; Early Bird, 16 ac.; Riverina, 16 ac.	End April.	60	40 low grade.	3rd	26	18½	28	19	10	26	127½
Ariah Park	A. T. Harris, "Ellerslie," Ariah Park.	Turvey ...	13 May.	62	90 low grade.	8th	29	18	22	18	10	26	123
Murrumburrah.	Hobson Bros., "Glenlea," Cunningar.	Waratah ...	May ..	70	84 low grade.	Over 6	23	19½	29	17	10	24	122½
Hillston ...	V. Chambers, "Kerami," Hillston.	Yandilla King.	First week May.	50	45 low grade.	4th	23	17	25	18	10	26 (27)	119
Cootamundra.	H. Rumble, "Carinya," Muttama.	Gresley ...	Last week June.	56	56 low grade.	Over 6	24	14	28	19	10	20	115

† Baroota Wonder. ‡ Other varieties.
* Maximum points, the same as page 102.

The third prize went to Barellan for a crop of Yandilla King grown by Mr. George Gow, which was very pure and free from disease, except for a slight infection of flag smut. There was a variation in the crop, due apparently to excessive water on portions of the growing crop, and the average yield of the 50 acres was judged to be 29 bushels per acre. The land was fallowed in August, springtoothed in September and three times in February, and sown on 20th April with 60 lb. each of seed and superphosphate per acre, the seed being treated with dry copper carbonate.

The crops of Messrs. F. C. Rowlands and Sons and Mr. Steve Kanaley ran a dead heat for fourth place, scoring only one point under the third prize-winner. The former was the highest yielding crop in the competition, grown on land which had been under cultivation for over fifty years. Unfortunately wild oats and saffron thistles were present in large numbers, which deprived Messrs. Rowlands of the championship. Waratah and Gresley were the varieties, and the former was a very heavy, pure crop, the apparent yield of which was judged to be 39 bushels. Had the whole of the crop been up to this standard it would have run out a winner in spite of the weed growth.

General Remarks.

Under the adverse conditions of the season it is pleasing to note that an average yield of over 27 bushels per acre is estimated to be returned by the fifteen crops judged, which reflects great credit on the competitors. It is generally observed in districts that are being newly opened up for the cultivation of wheat that the methods do not attain to the standard of those practised in older settled districts, and it is gratifying to find that crop competitions have been inaugurated in the Hillston and Cargelligo districts, which have in recent years been receiving an influx of new settlers, for they will serve to indicate the best methods suitable to the conditions of soil and climate.

The quantity of seed sown by the competitors ranged from 45 to 80 lb., and the amount of superphosphate applied from 40 lb. to 100 lb. high grade, which is equivalent to 129 lb. per acre of 17 per cent. superphosphate. It would be an advantage if wheat-growers would make a test for their own information with plots to which different quantities of superphosphate were applied in order to prove whether a profitable increase in yield is returned by increased applications. The crop to which the large application had been applied had "burnt off" somewhat, but as there was no check plot fertilised with a smaller quantity for comparison it could not definitely be attributed to an excess of superphosphate. Approximately 60 lb. per acre each of both seed and superphosphate were used in the production of the three prize-winning crops. Such factors as the characteristics of the variety sown, and the time of sowing, should influence the rate of seeding and the nature of the soil, and time of sowing should be taken into account when deciding upon the best quantity of superphosphate to apply. Most of the standard varieties of wheat were represented in the competition, and the most successful varieties were Waratah (which figured in seven of the fifteen crops judged), Turvey, and Yandilla King.

Waratah is a comparatively new wheat, which, however, has been in general cultivation for a sufficient number of years to prove itself to be a variety of high yielding capacity under varying conditions, and which bids well to outrival Canberra as the best early maturing variety. Turvey has been the most successful variety in the championship competitions since their inauguration, and it has established itself as a general favourite. Yandilla King is a variety that repays good treatment, but to be successful it requires to be sown early on well-fallowed land. Over a number of years it has given the best results of the field crops at Temora Experiment Farm, the average of the yields for five years being over 31½ bushels per acre. It is generally considered to be of too late maturity for success in districts of lower rainfall, but G. Gow, of Barellan, regards it as his best and most consistent yielder, and for the eight years that he has grown this wheat it has never returned him lower than 24 bushels per acre. Its suitability for the Hillston district is vouched for by one of the oldest settlers, who regards it as one of his standard varieties.

The increasing popularity of the dry copper carbonate method of treatment for bunt prevention was shown by the fact that nine out of the fifteen competitors had adopted this method. Four still held to the treatment with bluestone solution, and one had been treated with formalin. One competitor neglected to treat his seed at all, and bunt had made its appearance in the resulting crop, showing that by neglecting to adopt the precaution of pickling seed, one runs a grave risk of having to pay the penalty with bunted crops. Bunt was also prevalent in one of the crops, the seed for which had been treated with bluestone, and only a slight trace of the disease was detected in three crops grown from seed treated with copper carbonate.

The fungous disease most in evidence was flag smut, which is every year exacting a heavy toll from the wheat-fields, and which calls for greater attention to control measures. The most prolific source of the disease is infected stubble in the soil, although spores attached to the seed are also capable of causing the disease. The latter can be destroyed by the treatment of the seed as prescribed for bunt prevention, but to avoid infection by spores in the soil is a more difficult problem. The burning of the stubble of an affected crop is an important preliminary measure, but the chief factor in the reduction of the ravages of the disease is the adoption of a definite system of the cultivation of oats in rotation with the wheat crops. Oats is a crop that is not subject to attack by flag smut, and if followed by a year of bare fallow before the wheat crop is sown the flag smut spores are given an opportunity to germinate and perish owing to the absence of a host. Moreover, oats can be successfully grown throughout the wheat area, and even in the drier districts the newer, early-maturing varieties will succeed. Furthermore, it is a crop that can be put to many purposes, though it would soon cease to become profitable if large areas were grown for the simple purpose of producing oats for market. The grain is one of the best feeds for stock, and if stored is an excellent reserve

against drought; it is of high value as a hay or fodder crop. As an additional safeguard in the prevention of flag smut, the use of oaten hay is recommended in place of wheaten hay in feeding the horses, so as to avoid the danger of reinfection of the soil by the use of flag smutted wheaten hay, the vitality of the flag smuts spores being unimpaired by passage through the stomach and intestines of horses and other stock. The adoption of this rotation of crops would also aid in the suppression of other diseases to which wheat is subject, such as take-all.

In Favour of Wrapping Apples.

Further evidence of the value of the oiled wrap for apples is afforded by experiments recently carried out by a Sidmouth fruit-grower for the Devon County Agricultural Committee (England). The trials were designed to test the effectiveness of three methods of storing—(*a*) with oiled wrap, (*b*) with tissue wrap, and (*c*) without wrapping. Three standard bushel cases were packed in October, 1924, with an even grade of Bramley's Seedlings, 120 unblemished apples going into each box, the different lots being treated as described. The boxes were weighed and stored in an ordinary packing shed until the end of February, 1925, when the boxes were again weighed and the condition of the different lots of fruit noted. The loss from evaporation was small, being 1 lb. per bushel box in the case of wrapped fruit and 1½ lb. in the unwrapped fruit. Out of the 120 apples in oiled wraps there were 114 perfect, as compared with eighty-six of those in tissue wraps and only forty-seven of the unwrapped.

Control of Slugs.

To eradicate slugs and snails requires persistent effort, the first essential being, of course, clean cultural methods and the removal of any weeds, boards, or rubbish which would afford the pests shelter by day. They may be destroyed by the use of poison baits, dust sprays, or trapping.

Slugs are less fond of the baits than snails, but baked or boiled inferior-grade potatoes, sprinkled with white arsenic and scattered in the vicinity of the affected area have proved attractive; also pellets of poisoned bran mash (1 lb. of paris green and 24 lb. bran, sufficiently moistened) similarly scattered.

Of dusting agents, a mixture of one part of calcium arsenate to ten parts of lime, sprinkled lightly on the affected plants at dusk, can be recommended.

Strong arsenate of lead (1 lb. to 15 gallons of water) is an efficacious spray, if to the formula is added something in the nature of a "sticker"—say, ½ lb. soap, or, better still, either calcium caseinate or resin and washing soda, boiling together in the latter case 2 lb. resin, 1 lb. washing soda, and 1 gallon water for just over an hour, when the fluid should be a clear brown. This liquid is added to 50 gallons of the arsenate of lead solution.

Boards set out at intervals and baited beneath with portions of boiled potato form attractive traps; snails will congregate and shelter here by day, and may be destroyed in numbers.—W. B. Gurney, Government Entomologist.

The Effect of Fallowing on Soil Moisture.

R. D. LEES, B.Sc. (Agr.), Farrer Research Scholar.

THE universal adoption of fallowing by progressive farmers is an index to its importance in wheat production. That its valuable effects are due largely to the conservation of soil moisture is undisputed, but there are few, if any, records of its effect on soil moisture, numerous as are the records of its benefit to the crop. It was to fill this want that investigations were conducted at Wagga Experiment Farm.

Through the courtesy of the Manager and Experimentalist, two plots were made available, one of which has been cropped continuously, and the other cropped and fallowed alternately. Samples were taken from each plot monthly, to a depth of 3 feet 9 inches, and their moisture content determined. The investigations were commenced early in 1923, but as the differences in moisture content previous to October were not appreciable they have not been included in the table.

TABLE showing amount of moisture equivalent to inches of rain conserved by fallowing in the first 3 feet 9 inches of soil.

Month.	Fallowed Plot.		Unfallowed Plot.		in favour of Fallowing.
	Per cent. of Moisture.	Equivalent to Inches of Rain.	Per cent. of Moisture.	Equivalent to Inches of Rain.	
October	13·923	8·80	14·606	9·30	- 0·50
November	21·834	14·80	18·019	11·80	3 00
December	19·129	12·65	14·204	9·00	3·65
January	16 302	10·55	11·014	6·85	3·70
February	17·754	11·60	11 585	7·15	4·45

The table shows that fallowing results in an increase in moisture content, except in October, when the unfallowed plot showed the greater amount. The greatest difference (4·45 inches) was obtained as early as February, and there seems nothing to prevent this difference being maintained, if not increased, up till seeding, when the additional moisture will be invaluable. This increased moisture content was obtained by ploughing the plot early in 1923, *i.e.*, as soon as possible after harvesting, and cultivating when necessary until sowing time in 1924. As a result the surface of the plot was in a loose, friable state and the rains which fell during the fallowing period were able to penetrate into the soil and subsoil with little loss. Loss was further minimised by breaking up the compacted surface after rain, thereby checking evaporation, and at the same time killing the weeds, which are at all times a drain upon soil moisture. As a result of this treatment the seed-bed was in good condition, being in a fine, friable state, as well as having a reserve of moisture, equivalent to at least 4 inches of

rain more than the unfallowed plot. Such conditions are naturally more conducive to a satisfactory germination, and the young plants, having an additional supply of moisture, are better able to withstand dry conditions.

Another factor, which is of much importance, enters here—namely root development as influenced by superphosphate. It has been found that the application of superphosphate results in increased root development, the roots of the young wheat plants being stimulated to a remarkable extent and penetrating deeply and quickly into the subsoil (see *Agricultural Gazette,* September, 1924, page 609, and January, 1926, page 17). Two factors, therefore, are influencing the resultant crop—fallowing and the use of superphosphate—and they are beneficial for reasons which now become apparent. There is a reserve supply of moisture at sowing time on fallowed land, which promotes satisfactory germination and growth, and makes the superphosphate applied with the seed more readily available for the use of the young plants, whose roots are thus stimulated to quicker growth. The increased root development results in the plants being able to utilise the reserve of moisture, and so they are able to withstand conditions which would cause crops on unfallowed land to fail. Hence it would appear that in districts where superphosphate is known to be beneficial, maximum results would be obtained by the use of this fertiliser in conjunction with fallowing.

Another aspect worthy of consideration is suggested by investigations in Victoria, where Dr. A. E. V. Richardson recently conducted exhaustive experiments on the water requirements of crops. From the results he concluded that "each inch of rain received during the growing period of the crop is capable of producing 3·54 bushels of wheat." This theory has been proved not only by results obtained by experiment farms in Victoria, but also by several farmers in the Wimmera district, who have obtained yields of 3·4 to 3·6 bushels per acre for every inch of rain received by the growing crop. These results have been obtained in Victoria, but it is quite possible to obtain analagous results in New South Wales. The additional moisture stored by fallowing, as indicated by the table, should result in an increased yield of 15½ bushels, a yield which would more than cover the cost of production and maintainance of a fallow. The essential features of fallowing may be summarised thus:—

1. Fallowing will conserve an amount of moisture equivalent to at least 4½ inches of rain in a normal season, and is essential under the climatic conditions of the Australian wheat belt.
2. A good seed-bed is produced, which, together with the additional moisture, promotes satisfactory germination.
3. Owing to the stimulating influence of superphosphate on root growth, a combination of superphosphate and fallowing should produce maximum results.
4. Every inch of rain stored by fallowing is capable of producing 3½ bushels of wheat.

Field Experiments with Cereals.

TEMORA EXPERIMENT FARM.

Average Yields Over Recent Years.

H. C. STENING, H.D.A., Manager.

DURING the last five years there have been carried out at this farm experiments, the results of which should convey useful information to the cereal growers of Temora and similar districts. The soil on which they were conducted is red loam of slate derivation, with a clay subsoil at a depth from the surface averaging about 6 inches, and is typical of much of the soil of this locality. Each year the plots were sown early in May on well-worked fallow, with the exception of the oat variety trial in 1922, which was sown on stubble land. The seasons under review were favourable. The rainfall registrations during the effective period April to October in each year were as follows:—

	1920.	1921.	1922.	1923.	1924.
	points.	points.	points.	points.	points.
April	75	251	306	2	175
May	17	360	115	166	111
June	548	244	125	804	237
July	289	84	237	326	187
August	216	124	151	117	456
September	354	213	207	267	244
October	147	150	147	300	154
Total	1,646	1,426	1,288	1,982	1,564

In 1920, the crops lodged badly, and the whole of the yield was not recovered. In 1922, a poor germination was experienced generally, and this fact will explain the substantial increase in yield of the heavily-seeded plot in the rate of seeding trial in that year.

In order to make fair comparisons of the average yields it will be necessary to compare only the averages of the yields produced in the same years; otherwise the average yields as shown hereunder would be misleading. For instance, in the rate of superphosphate trials, the average yields of the plot manured at the rate of 84 lb. superphosphate per acre for the two years in which this plot was included in the trials exceeds by 6 bushels the average of the yields for five years of the plot manured at the rate of 70 lb. per acre, but if compared with the average of the latter plot for the same two years, it will be found to be slightly lower.

WHEAT Variety Trial (Grain).

Variety.	Yield per Acre. 1920.		1921.		1922.		1923.		1924.		Average.	
	bus.	lb	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Yandilla King	27	37	31	0	28	0	27	45	37	30	30	22
Federation	27	2	33	30	23	30	28	8	29	37	28	23
Waratah	24	0	26	45	22	52	24	0	43	26	28	8
Hard Federation	25	17	31	15	27	55	23	23	32	7	27	57
Bomen	18	0	32	0	21	17	28	2	36	31	27	10
Major	28	0	27	40	16	40	29	27	33	12	26	59
Currawa	23	54	30	20	23	30	25	15	31	9	26	49
Canberra	23	31	30	40	33	18	18	26	26	51	26	33
Marshall's No. 3...	25	0	25	30	16	13	27	17	36	51	26	10
Wandilla	......		32	30	19	40	33	54	39	43	31	27
Union	......		32	30	22	54	30	5	39	37	31	16
Penny	......		31	0	19	27	33	24	30	0	28	28
College Purple	......		28	30	25	7	26	17	32	51	28	11
Gresley	......		27	30	20	25	20	0	33	33	25	22
King's White	......		27	20	21	58	19	52	29	23	24	38
Improved Steinwedel	......		22	15	21	10	23	56	31	0	24	35
Firbank	......		18	0	16	4	13	0	20	24	16	52
Quartzy	......		......		45	22	29	21	35	42	36	47
Caliph	......		......		39	1	25	50	30	0	31	37
Queen Fan	......		......		20	24	31	3	36	0	29	9
Clarendon	......		......		23	40	21	6	24	0	22	55
Hamel	19	10	26	45	19	52	......		......		2	55
Florence	......		22	30	18	38	18	40	......		19	56
Zealand	19	22	24	30	9	0	......		......		17	37
Bena	......		......		......		30	6	36	4	33	5
Canimbla...	......		......		......		26	14	39	32	32	50
Cadia	......		......		......		26	55	37	21	32	8
Gallipoli	26	0	32	30	......		......		......		29	15
Sultan	......		......		......		25	0	32	6	28	33
Felix	......		......		......		24	0	31	47	27	53
President...	......		......		......		24	30	29	27	26	58
Onas	......		......		......		27	17	26	13	26	45
Warden	......		32	0	21	17	......		......		26	38
Rajah (S.A.)	......		......		......		23	27	28	52	26	9
Emperor	......		......		......		23	34	28	0	25	47
Aussie	......		......		......		23	45	26	34	25	9
Bald Knob	......		......		......		21	0	29	10	25	5
Maharajah	......		......		......		22	1	27	42	24	52
Wilfred	22	19	26	45	......		......		......		24	32
Riverina	......		......		......		15	37	25	18	20	28
Glencope	15	22	21	0	......		......		......		18	11
Ranee	......		......		......		......		40	0	......	
Rajah (Vic.)	......		. ....		......		......		36	55	......	
Baringa	......		......		......		......		36	24	......	
Bald Early	......		......		......		......		28	15	......	
Comeback	23	20	......		......		......		......		......	
Early Bird	......		......		......		......		22	37	......	

The objects of the variety trial are to ascertain the varieties returning the best yields over a number of years and to compare the yields of new varieties with those of proved standard sorts. Altogether forty-seven varieties have been tested during the currency of the trials, and several have been discarded after proving unsatisfactory for three years. It is recommended that wheat-growers should limit the number of varieties sown on their farms to about three, to include a late-maturing, midseason and early-maturing variety, thus serving to ensure a seasonable sowing for each variety and an extension of the sowing and harvesting periods. Until recently, the varieties recommended were Yandilla King as a late-maturer for early sowing, Federation for midseason sowing, and Canberra for late sowing. According to the results of the trials, the only rivals to Yandilla King are Wandilla, of which the four-year average of 31 bushels 27 lb. per acre exceeds the average of 31 bushels 3 lb. returned by Yandilla King for the same four years, and Quartzy, the three-year average of which was 36 bushels 47 lb. as against 31 bushels 5 lb., the average of Yandilla King for the same three years. Wandilla, however, has a weaker straw than Yandilla King and its results in field crops (sown earlier than the experiment plots) have not equalled those of the latter. Quartzy is not to be recommended, owing to the fact that it possesses red grains.

OAT Variety Trial (Grain).

Variety.	Yield per acre. 1921.		1922.		1923.		1924.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Myall	26	0	45	17	44	3	41	34	39	14
Guyra	32	0	27	12	41	28	54	25	38	36
Mulga	33	0	54	22	34	14	32	25	38	25
Algerian	32	0	28	0	34	20	52	35	36	[illegible]
Sunrise	22	0	43	18	33	8	47	20	36	22
Quandong	31	0	48	21	30	13	27	0	3	9
Lachlan	......		......		50	0	57	20	53	30
Algerian x Red Rust Proof	......		......		52	4	55	10	53	27
Belar	......		......		54	0	48	16	51	8
Ruakura	30	25	......		......		......		......	

Federation's great rival is Union, the average of which is 31 bushels 16 lb. as compared with the average of Federation of 28 bushels 41 lb. for the same four years. Union possesses the same characteristics of short straw and brown ear as Federation, and it appears to be less subject to infection by flag smut and rust. As shown by a comparison of the average of the yields for five years, Canberra is being outclassed by Waratah as an early-maturer; Waratah has a rather stronger straw and seems less susceptible to rust. Another possible rival of Canberra is Caliph, with a three-year average of 31 bushels 37 lb. as compared with the average of the yields of Canberra of 26 bushels 12 lb. for the same three years.

RATE of Superphosphate Trial.

Superphosphate per acre.	Yield per Acre. 1920.		1921.		1922.		1923.		1924.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
None	12	0	10	23	11	9	......		......		11	11
42 lb.	14	49	15	44	19	15	......		......		16	36
56 lb.	14	25	16	18	23	2	28	8	29	0	22	10
70 lb.	16	38	17	48	24	31	30	20	29	37	23	47
84 lb.	......		......		......		29	54	29	40	29	47
98 lb.	......		......		......		27	45	29	47	28	47

RATE of Seeding Trial.

Seed per acre.	Yield per Acre. 1920.		1921.		1922.		1923.		1924.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
40 to 45 lb.	15	11	15	4	18	24	24	42	29	9	20	30
50 to 55 lb.	16	35	16	8	18	51	27	13	29	31	21	40
60 to 65 lb.	18	16	15	50	23	8	27	0	29	38	22	46
70 to 75 lb.	......		......		26	40	26	51	29	35	27	42

TEST of Bunt Preventives.

Preparation used.	Yield per Acre. 1923.		1924.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.
Copper carbonate...	26	51	23	2	24	57
Copper sulphate, 1 per cent. solution	24	20	21	56	23	8
Formalin, ½ per cent. solution	23	9	22	48	22	59

THE SPREAD OF ST. JOHN'S WORT.

St. John's Wort, which is spreading in an insidious way in portions of the State, is one of the worst pests which the stockowner can come in contact with, as cattle which feed upon it are very liable to become affected with an extremely irritable skin condition involving those portions of the skin which are not pigmented. The irritation is so intense that the animals get into a continual state of restlessness and lose condition, and by biting and rubbing on irritable spots, extensive sores are caused, which heal only when the animals are deprived of the opportunity of eating the plant.

The condition is allied to that seen among sheep which are fed exclusively on trefoil and are exposed to a hot sun, but it is more severe.—MAX HENRY, Chief Veterinary Surgeon.

Crop-growing Competitions, 1925.

NARRANDERA.

R. G. DOWNING, B.Sc. (Agr.), Senior Experimentalist.

THE Narrandera competition comprised seventeen actual starters, several who originally entered withdrawing their crops when the party arrived to inspect them.

The winning crop, grown by Mr. J. H. Baldwin, of Square Knob, Colinroobie, was in every way a creditable one, and the condition of the rest of the crops on the farm bore the same evidences of careful preparation as did the competition crop. Mr. Baldwin is evidently a very thorough and careful farmer. The land on which the crop was grown was box and pine country (new land), the paddock being in a very sheltered situation between two hills. The 50-acre block comprised 40 acres of Federation and 10 acres of Waratah. The average yield was estimated at 31 bushels, while the Waratah was worth in the vicinity of eleven bags. The land was fallowed in June, harrowed three times and springtoothed four times before sowing in the first week in May with a combine. The rate of seeding was 85 to 90 lb. per acre, whilst the manure applied was 90 lb. of high grade superphosphate. The paddock was new ground. The rainfall during growing period was 9 inches.

The crop shown by Mr. Davies, of Parkeside, Brobenah, which gained second place, comprised three varieties, viz., Waratah, Gresley and Riverina. Although not such a heavy crop as Mr. Baldwin's, these varieties were truer to type. Mr. Davies also gained points on account of his paddock being old land.

Taken on the whole, the crops throughout the competition were very creditable, the average yield for the crops visited being in the vicinity of eight bags per acre. Owing to the wet winter the crops were mostly uneven, particularly those grown on the heavy country.

Type.

Perusal of the points under this heading shows great room for improvement. From inquiries made by various farmers, there seems to be an awakening to the necessity of clean seed, true to type. The prospects for improvement in this direction are also good, when one considers the crops grown by several of the competitors, which would make very suitable seed.

The Choice of Varieties.

Competitors for the most part pinned their faith to early and mid-season varieties. Several crops of late-maturing varieties, such as Turvey and Minister. were seen. As the season is turning out, these crops will pro-

bably give very good returns, but, at the same time, a word of warning is perhaps necessary. The late springs and summers of the last few years have been remarkably cool, whilst heavy summer rains have contributed to the success of these late varieties. We may, however, sooner or later expect a recurrence of the hot winds of early November, when the earlier maturing sorts will undoubtedly stand out. The yields obtained from such varieties as Waratah, Canberra, Gresley and Federation, even in seasons such as experienced during recent years, have been so good as to make it certainly much safer for farmers in districts like Narrandera to make their main sowing of similar sorts. Another advantage of these varieties, besides that of maturing before they are likely to be affected by hot winds, is, that in seasons of heavy winter rainfall and cold wet conditions, such as last season, they are usually able to outstrip the weeds, particularly in dirty ground, whilst later varieties are badly affected in this way.

AWARD Table

Name.	Variety.	Period of Cropping.	Type.	Freedom from Disease.	Evenness.	Condition.	Cleanliness.	Yield.	Total.
Maximum Points	....	......	20	30	20	10	*	†	
J. H. Baldwin, Square Knob, Colinroobie.	Federation and Waratah.	New land ...	18	29	18	9	22	31	127
T. E. Davies, Parkeside, Brobenah	Waratah, Gresley, Riverina.	Old land ...	19	27	18	9	25	28	126
Wm. Verner, Narrandera	Federation and Waratah.	Old land ...	18	27	17	9	28	26	125
W. Russell-Scilley, Corobinilla ...	Canberra	4th crop ...	17	27	19	9	26	27	125
Sewell Bros.	Firbank	4th crop ...	19	29	17	9	24	26	124
J. A. Irwin, Colmonell, Morundah	Kings Early ...	2nd crop ...	19	28	18	9	24	26	124
W. Collins, Narrandera	Federation ...	4th crop ...	16	28	17	9	24	29	123
C. A. and D. Sinclair, North Berembed, Grong Grong.	Turvey	6th crop ...	17	27	18	8	26	27	123
F. H. Handford, Grong Grong ...	Penny	New land ...	18	27	18	8	23	26	120
W. J. Putland, Kamarah	Federation ...	Old land ...	17	26	17	9	26	24	119
A. McInnes, Gum Swamp	Federation ...	5th crop ...	17	28	18	8	24	22	117
G. E. Dwyer, Grong Grong ...	Federation ...	New land ...	17	26	18	9	23	23	116

* Maximum for first crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over sixth crop, 30 points. † One point for each bushel of apparent yield.

Diseases.

The crops were very free from disease, even allowing for the fact that a big proportion of them were sown on new land. Very little foot-rot or take-all was noticed, whilst flag smut was not present to any extent. Several crops were found to be affected with bunt or ball smut, and in each case it was found that the pickling adopted had been bluestone. The use of the dry copper carbonate method seems likely to be universally adopted in the district next year. The advantages of this method do not need enlarging upon here.

Cleanliness.

In spite of an adverse season, the competition crops were remarkably clean. The same, however, cannot be said of many crops which were passed during the tour of the district. Black oat farmers seem far too prevalent

for a comparatively young district like Narrandera. In this connection it might be stressed that the same methods are necessary for the eradication of such pests as black oats and Cape weed, as for such troubles as take-all, foot-rot, and flag smut. Early fallowing, combined with intelligent working of the fallow and the growing of oats as a rotation with wheat will have to be more universally adopted. In this regard it might be added that the cultivation of such early-maturing oats as Mulga and Sunrise has not spread to the extent that it should. The advantage of growing such sorts as these is that the land may be cultivated after rain until the sowing of the oats in the middle of July and a very profitable crop obtained. The advantages of this autumn and winter cultivation in germinating black oats and weed seeds, together with spores of the diseases which are present in the ground should be obvious.

On account of the variation in soil types throughout the district, different methods of cultivation must of necessity be adopted, even on different parts of the same farm.

MURRUMBURRAH.

G. C. BARTLETT, H.D.A,, Agricultural Instructor.

Four separate competitions were conducted at Murrumburrah this last season, namely, (1) 50 acres wheat on fallow, (2) 50 acres wheat on stubble, (3) best farm of growing crops, (4) best farm.

There were not many entries, the most being nine in the crop competition. This was accounted for largely by heavy winter rains damaging the crops. The soils are mostly of a granite nature with mixtures of volcanic origin scattered through them, forming grey to red sandy loams that set down and cake on the surface readily. The timber is principally white box and gums. Most of the crops were spoilt by the inclusion of a portion of the flats in the competition block, and it was on the flats that most of the damage was done by heavy rains, the best crops or portions of crops being on the hills. The soil washes readily, and some of the paddocks had newly-formed washaways and water-courses in them. This washing is quite a problem in the district, and one farmer makes a practice of throwing stones from his paddocks into these washaways, also of lopping some of the trees and putting the branches in, with a view to stopping the rush of water and causing them to silt up again. Generally speaking, the practice is attended with good results.

The heavy rains of May and June did a lot of damage, both as regards soil washing and the practical flooding of the flats which remained wet for a long time and later set down with a hard crust, resulting in a choked crop. Under this treatment nearly all the crops in the country were very thin. A harrowing when the crops were about 6 inches high would probably have been beneficial.

The rainfall was 22·37 inches on the fallow, and 20·45 inches on the crop, made up as follows:—

On Fallow.	Points.
1924—July ...	200
August	445
September	185
October	217
November	508
December	139
1925—January	215
February	160
March	135
April ...	33
	22·37

On Crop.	Points.
1925—May ...	635
June ...	464
July ...	119
August	219
September	136
October	101
November	71
	20·45

The rain mostly took the form of very heavy squalls.

The Prevalence of Weeds.

Thistles were very bad last year and a good many were scattered through the crops this year. All the crops were marred by the presence of either thistles or black oats or both. It requires a lot more work to get rid of these, and it is rather difficult to do on account of the nature of the soil. The springtooth cultivator will not cut them out, and too much use of the disc will cause the soil to run together and cake on the surface. It is necessary to cut the thistles right out to a depth of about 3 inches, especially the black thistle, and the disc might be used in the summer months, leaving about two months before sowing time to allow the soil to settle and then be worked up with the springtooth cultivator again.

The use of the disc, especially in this district, is to be deprecated at almost any time, but when thistles are so bad as to warrant it the lesser of two evils has to be taken, and a certain amount of soil condition has to be sacrified. It is advisable to get rid of as many as possible by hand hoes, by the rigid tine cultivator, and by keeping sheep on the fallows. This will suffice, except when the thistles are very thick.

The Care of the Fallow.

Most of the farmers of the district do not attach enough importance to cultivating the fallow through the summer months. It is more essential to use the springtooth cultivator lightly during this time than any other implement, both to preserve soil texture and to conserve moisture, and also to keep down weeds. Certain weeds and barley grass carry diseases on to the following season. The district has shown its capabilities from a crop-producing point of view, and it has also been seen that good farming practices are necessary to produce good crops. Many farmers do not realise the value of proper treatment of the stubble. In most cases sheep are turned in and the stubble left till the fallow is ploughed in August or September. In many instances it would pay to sacrifice this feed and to get on to the stubble as early as possible after harvest. A good burn,

followed by a cultivation, would help largely to clean up the weeds and to rid the paddock of diseases, and also would help to secure an early germination of black oats.

Diseases.

It was pleasing to notice the freedom from disease this season. Last year the district suffered rather heavily from foot-rot and take-all. None of the crops were quite free from these two diseases, and a little of both was scattered throughout, but only one or two were affected to the extent of causing any serious loss.

A little septoria or leaf blight was general on the lower leaves, but it only occurred to any extent on the patches or plants already attacked by foot-rot or take-all. A little loose or head smut was general here and there in every crop.

Flag smut was found in almost every crop and appeared to be more prevalent on the flats, but only in one crop inspected was it present to any serious extent. Hardly any ball smut (bunt) was seen, and no rust or mildew.

If farmers practice a well-cultivated fallow and sow only seed that has been properly treated, there need be no fear from ball smut. Foot-rot, take-all and flag smut want watching in this district, and where they are observed to be prevalent it would be advisable to burn the stubble and follow with a well-cultivated fallow, and also, if practicable, a crop of oats and another fallow prior to the next wheat crop. A good fire will probably burn a lot of the fungus on the crown of the stubble, and a fallow free from weeds would go a long way towards starving the fungus out.

It is advisable to obtain seed from disease-free sources, and in this respect the Department's "pure seed list" is valuable.

Pickling, Grading and Manuring.

Most of the farmers used the bluestone pickle, but a good many of those spoken to expressed their intention of using the dry pickle next season. Farmers are strongly advised to use the dry treatment, as it possesses certain definite advantages. The seed can be treated at any time. The method is quicker and more convenient, it prevents a lot of reinfection from the soil, it is more effective in destroying smut in infected seed than a hurriedly-performed bluestoning, and a vastly improved germination is obtained.

There are two points to observe. First, a reliable machine that is as dust-proof as practicable should be procured, and, second, a high quality brand of powder should be used. A machine that tumbles the wheat about well and dusts every grain, at the same time putting through a reasonable quantity, is desirable. A striking instance of loss of germination through bluestone-treated seed was seen on one property. Owing to wet weather, seed that had been bluestoned could not be sown for a fortnight, at the end of which time it was sown alongside dry-treated seed. A loss of at least one and a half bags to the acre was evident through bad germination alone on the area sown with the bluestoned seed. It would not take many acres at this rate to pay for the machine in the first season.

All the crops were sown with graded seed, and it would pay farmers to have their own grading machines. A combined grader and pickler that performs both operations at one time would be a good machine and would quickly pay for itself.

All the crops were manured with superphosphate, varying from 45 to 84 lb. per acre, the majority being in the vicinity of 60 lb. Most of the farmers express their intention of applying much heavier dressings of superphosphate next season, but it is not advisable to sow much above 84 lb., until it is proved that heavier dressings pay. It would be advisable to apply about 84 lb. at present, and the manurial trials in the district ought to be interesting.

Varieties.

The varieties consisted of Waratah, Turvey, Marshall's No. 3, Penny, Yandilla King, Federation, Canberra, Wandilla, Currawa, and Hard Federation. Those that gave the best results were Waratah, Canberra, Turvey and Yandilla King, the two former being rather early maturing wheats and the two latter being late season sorts.

Waratah especially is showing up well all through the district, and it is noticed that it is amongst the prize-winners in many districts under varying conditions. Farmers would be well advised to sow more of it. Waratah and Canberra produced vastly superior crops this season to the old-established Federation.

The Crop Competition.

There were nine entries in the crop competition, and the following is the table of points scored by each competitor:—

Name.	Variety.	Trueness to Type and Purity.	Freedom from Disease.	Evenness.	Condition.	Cleanliness.	Yield.	Total.
Maximum Points	... ...	20	30	20	10	*	†	
Hobson Bros. ...	Waratah	19½	28	18	9	25	26	125½
B. J. Stocks ...	Marshall's No. 3 and Penny	19½	24	17	9	26	24	119½
C. Coddington ...	Marshall's No. 3, Wandilla, Canberra.	16	27	18½	9	24	24	118½
T. S. Elrington ...	Waratah	19	27	18	9	19	26	118
Hobson Bros. ...	Currawa and Hard Federation.	19	26	17	8	23	24	117
C. Coddington ...	Waratah	19	20	17	8	20	27	111
J. A. Downey ...	Yandilla King	17	26	16	7	21	22	109
W. J. Coddington...	Waratah and Turvey ...	18	22	16	8	19	25	108
J. A. Downey ...	Federation	18	23	17	7	22	20	107

* Maximum points: First crop, 24; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29 over six crops, 30 points. † One point for every bushel of apparent yield.

Wheat on Stubble Competition.

There were only three entries for the section for 50 acres of wheat on stubble. As a matter of fact, this is rather a good sign. Why this section was inaugurated was not definitely stated. The crop usually is and should have been already provided for in the ordinary 50 acres crop competition, where there is no stipulation that the crop is to be stubble or fallow, the stubble crops taking their chance with the fallow. Much of the value of crop competitions consists in showing the value of various farming methods. This section for stubble crops is considered entirely unnecessary, and as the Department has long since proved the value of fallowing and discourages stubble crops, the society was strongly urged to eliminate it.

Upon inquiry it was found that two of the entries (those of Mr. J. A. Downey) had been sown on land that had been grazed for six years, the land being ploughed in May and sown soon after. These decidedly were not stubble crops, so they were transferred to the section for wheat on fallow, as shown above. This left only one entry in the stubble crop section, and the points scored were very low.

The Best Farm of Growing Crops.

The section for the best farm of growing crops drew four entries by four individual competitors. The competition was judged by taking into consideration the various kinds of crops grown, the quantity and quality and how they were utilised, the efficient management of the farm, the size of the holding, the number and kind of stock carried, &c. This was won by Mr. B. J. Stocks, Linden Hills, Cunningar, Messrs. Hobson Brothers, C. Coddington, and J. A. Downey following in that order.

The winner has 1,800 acres, and runs 2,000 sheep (of which 1,000 are comeback breeding ewes), ten milking cows, eight brood sows (Berkshire-Tamworth cross), sixteen draught horses and six light horses. He grows 300 acres wheat, 120 acres lucerne, 150 acres Sudan grass, 100 acres of winter fodders, 50 acres oats, 8 acres Subterranean clover, and 3 acres field peas. Besides a large commercial area of good quality wheat, great foresight and efficient farm management is displayed in augmenting the pastures with stock fodder, and the conservation of fodder. Crops are specially grown for the purpose of the topping of lambs for market.

This section in the competition also appears unnecessary, as it is already embodied under farm crops and efficient farm management in the section for the best general farm. The society is advised to eliminate this section also, and to devote the prize-money to augmenting that already given for the best farm.

The Best Farm.

The section for the best farm only drew three entries. It is a very valuable section and worthy of a good cup or some such trophy. It was judged under the below-mentioned scale of points, taking into consideration the number and quality of stock carried, the amount and quality of the crops grown in proportion to the area of the holding, &c. Farm buildings

were considered with a view to housing, machinery kept, machinery necessary to the efficient working of the farm, &c. The winner was again Mr. B. J. Stocks, who may be said to have a model farm. Mr. Stocks started from scratch eighteen years ago coming from South Australia, and has worked the holding up himself. He employs several lads from time to time, who, under the watchful eye of the owner, obtain valuable experience and knowledge, and the farm is run economically and efficiently.

Besides the stock and crops mentioned in the previous section he has 200 tons of old hay, 100 tons of new wheaten and lucerne mixed hay in reserve, and 200 acres of well-kept fallow. An excellent orchard adjoins the house, the trees being pruned and sprayed scientifically, and no weeds allowed to grow.

A good homestead is centrally situated, having spacious verandahs right round, with the doors and windows "gauzed in." An air gas plant for light is installed, a septic tank system provides sewerage, and in front is a well laid out and kept garden. An excellent water supply with an ample reserve is in existence with a view to convenience to stock, and the convenience of the house and outbuildings.

The machinery is kept in good order, and everything is housed in spacious substantially built sheds. Up-to-date machines and implements, together with good engines, are to be seen in the outbuildings.

The horses are bred on the place, are of good quality, and are kept in good condition, being well fed, groomed, hoofs trimmed, &c. The whole place is well kept, with no rubbish, old parts of implements, or old iron, &c., lying about. Good fences and substantial gates opening to all parts, and a drive and breakwind of trees have been planted. Many of the trees in the paddocks are lopped, which improves the trees, while the branches help to fill up the watercourses. The pig sties are built similarly to those on the Government experiment farms.

The owner believes in a well-worked fallow, dry pickling of seed, and graded seed from a good pure source, and pays a lot of attention to noxious weeds and rabbits. He raises a good lamb, which is topped off on some fodder crop, and which always realises a good price, and he cuts a fine sample of comeback wool which also sells well.

Great foresight and efficiency is displayed throughout in the management of this farm. The weak point was lack of efficient sheep yards, but new and up-to-date yards are now in the course of construction.

The competitor placed second in this competition deserves great credit. He has only been on the property two years and was previously an engineer. The improvements carried out in so short a time are remarkable. The system of water supply is the best the judge has seen for a long time. It only wanted a septic system to make it perfect. His pig sties, with the exercise yards, brooding pens, and adjoining grazing paddocks are a model. The manner in which the property is kept and managed is very little short of the winner.

The following is the scale of points and the points scored by each competitor:—

	Possible Points.	B. J. Stocks	J. W. Rose.	W. J. Coddington.
Farm methods and management	40	38	36	30
Growing crops	35	32	25	28
Water supply	30	28	29	25
Horses	25	22	15	20
Sheep	20	18	16	20
Fodder reserve	20	18	19	18
Plant and implements	20	19	18	16
Fences and stockyards	20	14	18	16
Residence	20	19	18	16
Pastures	15	13	14	12
Outbuildings	15	14	12	10
Tree planting	10	8	2	2
Orchard and vegetables	10	8	7	6
Cattle...	5	4	3	5
Poultry	5	4	4	3
Pigs	5	4	5	1
Insurance	5	5	5	5
	300	268	246	233

INFECTIOUS DISEASES REPORTED IN DECEMBER.

THE following outbreaks of the more important infectious diseases were reported during the month of December, 1925.

Anthrax	4
Pleuro-pneumonia contagiosa	5
Piroplasmosis (tick fever)..	Nil.
Swine Fever...	Nil.
Blackleg	1

—MAX HENRY, Chief Veterinary Surgeon.

"WHAT THE DEPARTMENT IS DOING FOR FARMERS."

CONSIDERING that the history of the Department goes back some thirty-five years, it is remarkable that its activities on behalf of the farmer are not more generally known. The importance of publicity in the way of dissemination of information acquired has, of course, long been recognised by the Department, constituting, as it does, one-half of its task, and everywhere to-day there is evidence of a growing appreciation of the commercial value of this information. Just how the Department functions, its general design, and how each branch operates for the benefit of the man on the land, has now been described in a little publication, the name of which gives this paragraph its title.

While not professing to describe the activities of the Department in detail, this booklet nevertheless gives an excellent idea of the scope of its operations. It is obtainable free of charge on application to the Under Secretary and Director, Department of Agriculture, Bridge-street, Sydney.

Arsenical Poisoning in Sheep Associated with Dipping.

Reports of losses in sheep following dipping have recently been received from several districts. In the cases brought to notice the mortality has been due to arsenical poisoning. Arsenical poisoning associated with dipping may follow as a result of any of the following factors:—

1. Sheep actually swallowing the dipping fluid while in the dip. This is largely preventible by careful handling. It probably only accounts for a few odd sheep.
2. Absorption of the dipping fluid through the unbroken skin. This would be liable to occur if the dip were mixed to too great a strength, or if the sheep were dipped when overheated. In these circumstances the losses would tend to be heavy.
3. Absorption of the dipping fluid through broken or wounded surfaces in the skin. About one-tenth of the amount of arsenic required to kill by swallowing is necessary to kill in this manner. Dipping too soon off shears and injuries caused by grass seeds must be considered in this connection.
4. By licking the wool of other sheep in closely-packed draining pens.
5. By eating grass, herbage or trefoil seed saturated with dipping fluid in the holding yards. This factor may be eliminated to some extent by holding the sheep in the draining pens for sufficient time. In two of the cases recently reported the deaths are considered to have been due to the sheep eating trefoil seed.

In acute cases the following symptoms may be noted:—Salivation and thirst, profuse diarrhœa, which may be bloody; sheep rapidly become exhausted, fall down and die. Death follows in eight hours to a few days, according to the severity of the case and the condition of the sheep. Weakness or paralysis of the hind legs, trembling and coldness of the extremities may be seen in the less acute cases The most constant change noticed on post-mortem is an intensely red inflammation of the lining membranes of the fourth stomach and intestines. The liver is usually yellowish in colour.

Treatment.—The specific antidote for arsenical poisoning is freshly precipitated iron hydroxide. It is not possible to keep this on hand for emergency use, as it must be made up fresh, but it should be possible to secure it at short notice from a chemist.—A. L. Rose, Veterinary Surgeon.

Shade and Sunshine for Stock.

From early youth stock should be allowed to derive as much benefit as possible from direct sunlight, but at the same time there should be protective shade of which they can avail themselves as nature requires. This latter requirement is sometimes overlooked by sunshine advocates and young animals are consequently often subjected to intense heat from the rays of the sun when it would have been to their benefit had shade been provided from which they could move out into the sun when they were inclined. They should have access to sunshine when it is available, and they should be permitted to withdraw into the shade when instinct prompts them to do so.—J. A. Robertson, Herdmaster.

Glen Innes Experiment Farm.

Its Suggestions on Progressive Tableland Farming.

W. H. BROWN, Editor of Publications.

WHILE the suitability of the New England pastures and climate for growing wool of the finest quality has been accepted for generations, the practice of associating livestock farming with agriculture on these elevated tablelands has so far had but a limited following. A few have combined the two in some way, but the number has always been small and the application of the principle has usually been on somewhat narrow lines. The possibility of dairying or of the raising of fat lambs or of some other animal industry being the distinctive feature of the operations of a farm (as distinct from a grazing property), and of the crops being marketed in the form of livestock products (in other words "on the hoof"), has as yet hardly been appreciated.

In the past the agriculture of the Glen Innes district in particular has consisted of the production of wheat and oats for chaff, and of maize and potatoes (the latter to a limited extent only), the chaff crops being marketed in Brisbane and southern Queensland, and the others chiefly in this State. North and south of Glen Innes the problems are rather different. On the north side maize is the principal agricultural product, but dairying has a substantial following, while on the volcanic lands to the south of Glen Innes potatoes are the conspicuous feature of the farming, with oats as the usual change crop.

It is within the mark to say that over the whole of this tableland area there could be an extension of the practice of animal husbandry in connection with farming to the substantial advantage of all classes of producers, but as to the country surrounding Glen Innes in particular, it is certain that livestock should figure more largely in the farming programme, both because it would enable the produce of the district to be marketed in a more profitable form, and because it would assist materially in maintaining fertility.

As a matter of fact, certain economic factors are beginning to enter which threaten to necessitate a change of front on the part of Glen Innes farmers. The Brisbane market for chaff, long enjoyed in a rather exclusive way, has in late years been invaded by Riverina producers, who find that their conditions, their economical methods, and their organisation of the business enable them to compete quite successfully with the Glen Innes growers, even though they are at such a disadvantage as to distance.

Maize, the other principal product of the locality, is confronted by a situation not altogether dissimilar, tableland crops of 20 to 30 bushels having to compete (at a considerable disadvantage as to the cost of growing

and harvesting) with coastal districts where the crops commonly run 50 bushels and more per acre. Thus the pressure of changing times suggests that in the near future farming methods around Glen Innes must undergo modification, and that other channels that offer better opportunities will have to be sought out.

Sign Posts.

It is this situation that has led the Department of Agriculture to give prominence in the last few years to livestock as a special feature at Glen Innes Experiment Farm, and to pay much attention to the testing of many crops and many methods by which supplies of fodder of all kinds may be increased. Not, indeed, that the requirements of the present farming system of the district have been overlooked, for many experiments of value in that connection also are being conducted, but that the situation demands that the Department be prepared just now to point the track along which producers may, in the future, most safely and successfully take their way.

The Manager of the Farm, Mr. G. C. Sparks, is an enthusiastic advocate of the forward movement, and "Farmers' Day," which this year fell on Saturday, 5th December, was made an occasion for bringing under the notice of the 1,000 visitors the many ways in which the Farm is serving the Northern Tablelands, and in which it is anticipating the requirements of the future. In his conduct of the visitors round the Farm, and in his address over the luncheon, he indicated the need for farmers adapting themselves to the situation that is arising, and urged attention to the sign-posts which the Farm is erecting.

Mr. A. H. E. McDonald, now Superintendent of Agriculture, also seized the opportunity to point out that mixed farming must be practised more extensively, and that stock must enter much more into farming operations. To develop the land to its maximum capacity, he insisted they must have livestock and must grow fodder crops for consumption on the farm.

The conditions were in every way favourable for a most successful "Farmers' Day." The spring had been a fair one, withal distinctly late, and substantial rains had fallen a fortnight before which had clothed everything in verdant colours. The weather was on its best behaviour, and the visitors were able to see every section of the Farm under the most advantageous circumstances, being piloted round by the Manager and Farm officials, who took pleasure in indicating the numerous lessons that experiment and research have taught.

The Dairy Herd.

Many of those who followed the company from section to section were particularly impressed by the appearance of the fine Ayrshire herd located on the Farm. Dairying is thought by many to be impracticable around Glen Innes on account of the severity of the winters, but after all the severity is only relative. People who mentally associate dairying with the long, warm summers of the North Coast, are apt to regard the Tableland

A Group of Stock on Glen Innes Experiment Farm.

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climate as harsh, whereas in reality it is not. Certainly the winter is long and rather cold, and the spring is apt to be dry, which means that the period in which hand-feeding has to be practised looks rather lengthy, but one of the things Glen Innes Experiment Farm has proved is that the conditions generally are so favourable and the resources in the way of fodders are so great—in other words, it is, as Mr. Sparks says, "such great stock country"—that it is quite possible to dairy all the year round. Rugging is essential, of course, in the winter, but it is neither expensive nor troublesome, and the wide range of fodder crops that the climate and soil of the district make available, combined with ordinary methods of conserving fodder, make winter feeding quite practicable, and, moreover, profitable. "Even if no actual profit was derived from hand-feeding in winter," said Mr. Sparks, "the condition in which the cattle would come forward in the spring would make it quite worth while. Without hand-feeding in the winter it would be well on in summer before they were in full profit. Even cows that are dried off in the winter in view of freshening in the spring require a good maintenance ration in the winter." Plenty of silage is fed on the Farm (say, 30 to 35 lb. per cow per day), with 6 to 8 lb. of lucerne hay, and it is found quite a payable proposition to add 2 lb. linseed meal and 4 lb. bran. The rest of the feeding is done by grazing, native pastures and the stubble of straw crops furnishing sufficient for most purposes.

The extensive cropping and experiment work going on generally ensures plenty of feed, but sown pastures are essential to best results, and tests conducted during the last few years have shown that valuable grasses and pastures are available. The point of which farmers should take notice, however, is that dairying is practicable in this country, that a variety of suitable fodders is available, and that it will pay.

The excellent records put up by several animals in the herd are proof that New England is capable of something better than ordinary in the way of milk and butter production. First and foremost in this connection is the performance of Miss Dot, who during the twelve months ended 6th January, 1926, produced 1,088 lb. of commercial butter, thereby establishing an absolute record for the breed in Australia. Miss Dot, who is now 10 years old, was bred on the Farm, her sire being the imported Wyllieland Bright Lad, and her dam Lady Dado. During the test she was fed largely on maize silage, together with linseed meal, bran, lucerne chaff, oaten chaff, and green wheat, and she also had ordinary paddock grazing. Her daily ration towards the end of her testing period was 4 lb. wheaten chaff, 4 lb. lucerne chaff, 15 lb. maize silage, 6 lb. bran, and 4 lb. linseed meal, plus grazing.

Among other good performances put up by individuals in this herd may be mentioned that of Snowdrop of Glen Innes, who produced 874 lb. of commercial butter in a twelve months lactation period, and Bright Eye (a daughter of Miss Dot), who in the first five months of her current testing period produced 430 lb. commercial butter.

The Ayrshire stud is headed by the bull Statesman of Grafton (A.H.B. 2910), who was reserve champion at the Royal Agricultural Society's show, Sydney, in 1922 and 1923, and who himself manifests the qualities of a dairy sire.

A Stud of Berkshires.

Linked with the problem of successful dairying, of course, is the keeping of pigs. Already quite a number of New England farmers have proved that these will do well, and the demand for the young stock from the stud of Berkshires lately established at the Farm is steady.

For these also there must be a constant supply of feed, and the cheapest is undoubtedly what is raised on the farm. One newly arranged experiment is to test the value of soy beans fed green as against soy beans fed dry, and both in comparison with the ordinary "hogging down" of maize. Lucerne is also used as a grazing crop for the pigs, and with every indication of success, but care is needed that the stand be not grazed too heavily.

Contemporary with the development of the Berkshire stud has been a considerable reorganisation and improvement of the sties, and the young stock (almost growing as you watch them) are housed under conditions that favour constitution and development. The stud is headed by the boars, Wilmott Brigadier (5082) and Newington Blackwood (6360), with whom are several pedigree sows of great quality obtained from the studs at Hawkesbury Agricultural College and Wagga and Yanco Experiment Farms.

Fat Lamb Raising in New England.

The possibility that New England farm produce will some day be marketed "on the hoof" must also have found confirmation in the minds of some on 5th December when the sheep came under review. As in the case of dairying, there have been many who have regarded the raising of fat lambs as quite impracticable under such conditions. The pastures will produce wool—anybody would admit that—but neither the pastures nor the climate are suitable for fat lamb raising—so at least it has been argued.

Yet the experience on the Farm has been quite otherwise. The distance from shipping facilities is certainly great and the loss in weight and bloom between Glen Innes and the killing works is more than central-western, and Riverina farmers have to face, but the returns obtained are still decidedly encouraging, and cross-breeding experiments which are being conducted at the Farm are bound to be of greatest importance. Rams of four British breeds (Lincoln, Border Leicester, Romney Marsh, and Dorset Horn), are being mated with Romney Marsh grade ewes (most of which are three-quarter bred Romneys), and it is anticipated that from one of the crosses a useful type of lamb that will mature quickly under the conditions will be obtained. The wool from one or two of the crosses is somewhat coarse, but by way of reassuring the sceptical it may be said that it is all quite marketable—a fact of importance should unfavourable weather or other circumstances prevent the sale of the lambs as fats.

In addition to the purebreds and crossbreds essential to these experiments there is located here the Department's stud of Lincoln sheep, and its steady improvement is evidenced in the fact that one of the rams won the grand championship at the Sydney sheep show in 1923. An account was given the "Farmers' Day" visitors by Mr. H. S. Rogers, sheep and wool instructor, of the crossbreeding experiments conducted by the Department at this and other experiment farms, and indications of the possibilities of New England in this respect were given at the same time.

Fodder crops are just as essential to the raising of fat lambs on a profitable basis as to dairying. In this country the lambs are dropped in the spring and marketed in the autumn at about five months old, which means

"Miss Dot," Ten-year-old Ayrshire Cow.
This cow established an Australian Record for Ayrshires, by producing 1,088 lb commercial butter in 365 days.

that succulent fodder must be available during the winter to keep the ewes in good health, and later for them to lamb on, while throughout the spring and early summer there must be a steady supply of feed that will maintain a full supply of milk for the growing lambs. Such a succession has already been outlined in connection with the feeding of the cows.

A Clydesdale Stud and other Features.

Within the last year or two a Clydesdale horse stud has been started at the Farm, with the stallions Bangaroo Lettre (11 C.C.S.B.) and Bangaroo Symbol (441, C.C.S.B.), the latter being chiefly located at Armidale and Uralla. Among a very nice lot of stud mares that exhibit quality and stamina are Bessie Lea (1672 N.Z. C.S.B.), (imported from New Zealand), Bangaroo Esmeralda, Bangaroo Dolly, and Nannie Warden. Of five foals

by Lettre dropped this spring two have been entered in the stud book. Two particularly fine foals of the stallion High Honour, imported from New Zealand in 1922, were born the previous year, and are objects of pride to the Manager and staff.

It is unnecessary to follow the "Farmers' Day" company through the many sections in detail. The new buildings that have lately been erected, the equipment added, the fences renewed, the collection of useful and ornamental trees and shrubs growing near the administrative buildings (which in a day to come will be an invaluable object lesson to farmers who want to know what they may plant with best advantage), the well-kept orchard, where old unprofitable varieties are being displaced and worked over to newer and better sorts, and where valuable information as to the control of pests, especially woolly aphis, has been obtained—all this and much more aroused interest.

Many Experiments with Many Crops.

Of greater moment to the New England farmer is the immense amount of experiment work that is going on with innumerable crops and methods, the object of which, of course, is to discover how farming may be made most profitable, and what are likely to be the most valuable fodder crops for the livestock farming that is looming on the horizon. So many are the issues to be settled—so great the variety of crops and methods to which this country lends itself—that out of the 1,100 acres that comprise the Farm, not less than 170 acres are utilised for experiments, 125 acres being under cropping tests, and 45 acres under various grass and pasture trials.

As the livestock question is so much before us, it is approppriate to consider these many experiments in that relation, and therefore to begin with the winter cereals, which are of such value as furnishing green feed at a period when other crops are out of season. It goes without saying that any change in the use to which such crops are likely to be put is certain to have some effect on the variety and perhaps upon the class of grain grown. The declining prices obtained for oats in recent years have diverted attention to the question of a cereal that will usefully follow maize, and some of the quick-growing cereals that have already proved popular elsewhere are likely to come to the front. Thus, though Genoa wheat has been—and still is—valued as an early planting variety that crops reliably, Clarendon has made progress in favour as a wheat that can be sown in August, after the maize is harvested. Its early habit of growth had brought it out in ear by "Farmers' Day" with promise of an eight-bag crop. The seed of this variety is in great demand locally, as also is that of Florence, another useful dual-purpose short-season wheat for these tablelands.

Among oats, Algerian is still the favourite in the district, and on the Farm it is the basis of comparison for both early and late plantings, but Guyra, a Departmental hybrid which ripens a little earlier than Algerian, and enables the ground to be cleared more quickly, is coming into favour. Among the late sowings the old White Tartarian is being displaced by a

selection from it named Reid, which is slightly earlier, stronger in the straw, heavier in yield, and apparently somewhat smut resistant. Sunrise, which has proved so valuable as a short-season variety in other districts where early maturity is desired, is also attracting attention here.

Black Winter rye has great possibilities as a green fodder crop, and should be watched

Where livestock have to be fed through the winter when the pastures are poor and spare, the importance of these cereals lies not alone in the hay or grain they produce, but in the green feed they afford in the winter months. By sowing two or three varieties it is possible to have a succession of crops suitable for grazing at a time when something green is a welcome addition to the silage or chaff that necessarily forms a substantial part of the ration.

Silage, Legumes, and Others.

Silage is cured in considerable quantities and fed throughout the winter in conjunction with the cereals. It is valuable not only as a bulky fodder for which cattle quickly contract a taste, but its succulence gives it a laxative effect that is specially desirable if such dry materials as legume or cereal hay are being fed at the same time.

With a view to ascertaining what crops produce the greatest bulk of material suitable for the purpose, several experiments are being carried out. Maize is, of course, the standard crop for the purpose, Wellingrove being the variety favoured by the Department, but an American dual-purpose sorghum Darso is also under trial. It is stated to yield up to 70 bushels an acre, and to thrive on land where maize will hardly do at all. The grain can be used as a substitute for maize for horses—in a trial last year the farm horses were fed on it with excellent results—while the stalk is particularly fine and ensiles well. Sunflowers have also been tried, and seemingly with some promise.

As the spring comes in other crops, such as lucerne and clovers, move up and offer the farmer-grazier high quality fodders with which to supplement the pastures. Lucerne has done remarkably well on the Experiment Farm, and the top-dressing with superphosphate, which in the last season or two has attracted so much attention elsewhere, has for some years been a regular and profitable practice here. The late, dry season affected the germination of some of the clovers this season, and the comparative plots did not look so well on "Farmers' Day" as they usually would, but Perennial Red clover attracted attention in the rotation experiments.

Later still in the season come soy beans, which at present are under trial in a special way, as stated above.

Maize necessarily has a place in any feeding programme in New England, and much improvement work has been done with Wellingrove, the variety that has become specially adapted to local requirements. For grain growing, Glen Innes can hardly be compared with recognised maize districts, but grain for local and home purposes will no doubt always be raised here—

most profitably when fed to stock on the farm. On the other hand, the quantity of succulent, palatable fodder that a maize crop yields will always give it a place for green feed and for silage purposes.

It need hardly be remarked that each of these fodder crops involves problems of its own that have to be solved or partly solved on yet further experiment plots. Questions of cultural methods, the amount of seed to be used, the best fungicide, the most profitable fertiliser, the time of sowing, and so forth, all arise in relation to each crop. Then the fertility of the land must be maintained, and very complex problems of rotation present themselves. In fact, no less than seven different rotations are being tried. Of these, one comprises simply maize and White Tartarian oats alternatively, but three other experiments cover three-course rotations, and yet another three comprise four-course rotations. Quite a number of problems are involved in this extensive series of trials, no less than twenty-three plots being included. Necessarily it will be some years before much can be said about the results; but then one American institution ran a rotation experiment for about thirty years before it attempted deductions from the results!

Pasture Improvement.

The question of pasture improvement is a real one in New England, and especially so if the farm is to be stocked to its full capacity. The native pastures have but a small carrying capacity, and in any case must be supplemented in the winter if livestock are to become a larger feature of New England farming. For sowing on cultivated land *Philaris bulbosa* has given outstanding results. It is perennial in habit, nutritious, succulent, and resistant to dry conditions. It stands pasturing well, and one pasture at this Farm, which has been continually stocked for some years, shows a fine turf. It should be sown at about 5 lb. per acre on cultivated land, with, say, 70 lb. superphosphate. Heavier seedings have been recorded, but on the Experiment Farm the 5 lb. has given very good results. It is quite useful in a mixture, though its vigour will ultimately result in its dominating other grasses sown.

Several grass and clover mixtures are under trial, and the results promise to be of considerable interest to tableland graziers, but one mixture of cocksfoot, rye grass, and Perennial Red clover, and another consisting of *Phalaris bulbosa* and White clover, are decidedly promising. The top-dressing of pastures with superphosphate has been tested on both introduced and native grasses, with encouraging response in the former case, but up to the present without any effect in the latter. Hooker's Fescue and Tall Oat grasses are also giving good results, being perennials and providing green feed during winter months.

Considerable interest is taken aroung Glen Innes in the stream of Dreadnought boys which passes through the Farm. About twenty-five are continually in residence, each one remaining, on the average, about six months, during which time he receives a useful training in farming, and is presently qualified to take private employment or to look around for land for himself. The training given at the institution—both in the class room

and in the field, is so sound and varied that it is safe to say that were it fully appreciated the institution would be full of the sons of local farmers rather than with immigrants. No better testimony to the value of training could be offered than the fact that the Dreadnought boys are known to hold their jobs, very few indeed are not still employed on the land, and many of their employers have expressed their entire satisfaction with them.

If the Department feels a measure of confidence that the complex problems that confront New England farmers are being touched at Glen Innes Experiment Farm from practically every possible angle, and that the results are already indicating the directions in which progress should be made, it is surely justified in doing so. Whether it be pasture or cultivated crop, whether grain or fodder, whether sheep, cattle, or pigs, there is a desire that the business of farming in this part of the State shall become more attractive, secure, and profitable year by year.

The quarters at Glen Innes Experiment Farm.

Canadian Seeds for British Afforestation.

Coincident with the recent announcement that the British Forestry Commission will this year set out 39,000,000 trees, increasing the total plantations in the British Isles during the past five years to 200,000,000 trees (says a news bulletin of the Federal Department of Markets and Migration, Melbourne), the Dominion Timber Agent for British Columbia reports that since 1921, 10 tons of tree seeds have been shipped from the seed extraction plant at New Westminster to England. Reports to the Dominion Government are said to show that 65 per cent. of the seed shipped germinated.

and muc Canadian Government supplies the British Forestry Commission
that has be seeds at the actual cost of extraction, which is said to be but one-
ing, Glen Ir e market price of the seeds. The Governments of New Zealand,
but grain fo 'rance, Norway, Sweden and Germany are said to have also
ree seeds from the plant at New Westminster.

Reports of the External Parasites in Sheep Committee of the Departmental Research Council.

No. III.—Biological Notes on Sheep Blowflies in the Moree District.

W. B. GURNEY, B.Sc., F.E.S., Government Entomologist, and
A. R WOODHILL, B.Sc. (Agr.), Assistant Entomologist.

In last issue of the *Agricultural Gazette* we published an article dealing with the range and longevity of sheep blowflies. While engaged upon that work we also undertook some investigations upon the incidence of the different species of blowflies in the Moree district. Incidentally, as time permitted, some data on the biology of the sheep blowflies and of the predatory beetle *Saprinus laetus* was obtained.

In this present article we propose to summarise the data obtained, and to make some references to the parasites of the blowflies.

For the convenience of pastoralists and others the following statement of the five species of blowflies infesting sheep, which was given last month, is repeated:—

(1). *Chrysomyia albiceps* is a metallic green fly, the maggot of which bears small tubercles, and is commonly called the "hairy maggot."

(2) *Lucilia sericata* is another metallic green fly, rather smaller in size, but the maggots are smooth, not hairy.

(3) *Neopollenia stygia* is a common blowfly with yellow hind body, and larger than the next species (No. 4).

(4) *Anastellorhina augur* is another common blowfly, somewhat smaller than No. 3; hind body yellow, but central portion a dull blue.

(5) *Chrysomyia varipes* is a small metallic green fly, similar also to No. 1, but much smaller; has a hairy maggot.

To register the incidence of the different species of blowflies, six specially constructed traps were set out. These traps were re-baited every fortnight, and maintained in position for one year. The flies captured were removed each fortnight, the various species separated and identified and counted, and the number of males and females of each species recorded.

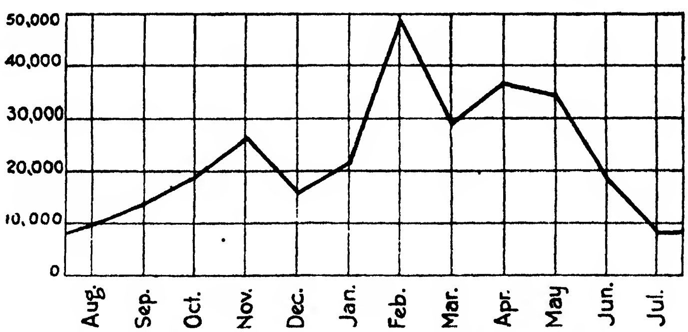
The traps were placed in contrasted situations, *e.g.*, in open plain country, in timbered country, and near permanent water. The numbers recorded from each trap were tabulated each month. A total of 281,806 flies was captured and identified in accordance with the above plan. At the same time maggots were collected from sheep, and some record was kept of the percentage of each species attacking living sheep throughout the year.

A record was also kept over the whole period of the daily rainfall, temperature, humidity, and wind.

The first table and graph detail the numbers of flies taken in the record traps in each month. Six traps were employed for these particular records, except during the first four months, when only five were in operation. It will be seen that females were caught in much greater numbers than males.

TABLE I, showing numbers of each species of fly taken in special record traps during twelve months.

	A. augur.	*N. stygia.*	*C. albiceps.*	*C. varipes.*	*L. sericata.*	Other spp.
1924.						
August	4,314	4,281	115	68	628	210
September	4,442	4,330	709	246	3,596	835
October	3,659	2,880	4,683	381	6,496	793
November	380	214	20,071	1,625	2,265	1,373
December	45	43	11,254	1,239	890	2,069
1925.						
January	2	26	14,995	1,744	154	3,994
February	35	109	35,037	5,479	290	7,890
March	160	82	20,413	3,513	153	4,875
April	1,424	136	25,937	5,669	719	3,585
May	9,485	839	14,197	3,657	4,483	1,641
June	10,862	1,819	2,815	1,520	1,148	448
July	6,448	1,427	130	187	144	2
Total of females for twelve months ...	39,595	13,406	128,602	......	18,018	......
Total of males for twelve months	1,660	2,780	21,754	......	2,948	......
Total of both sexes for twelve months ...	41,255	16,186	150,356	25,328	20,966	27,715
Total of all species for twelve months ...	281,806	......	......	......	......	......



Graph No. I.—Monthly catches of Blowflies of all Species at Midkin, Moree.
Taken in Special Record Traps in twelve months.

The proportion of males to females captured month by month proved exceedingly variable, and no exact correlation can be made with the seasonal increase or decrease in the number of each species as shown in the previous table. There was some tendency for the percentage of males to be highest when the greatest number of the particular species was present, though this did not hold throughout. It will be seen that the percentage of males was never higher than 25 per cent., which was perhaps to be expected, as they are not under the urgent necessity of finding carrion on

which to deposit eggs or maggots as is the case with the females. It is of interest to note that several counts made of batches of flies bred from carrion showed that the males and females were developed in approximately equal numbers.

TABLE II, showing percentage of males of each species caught in the special record traps.

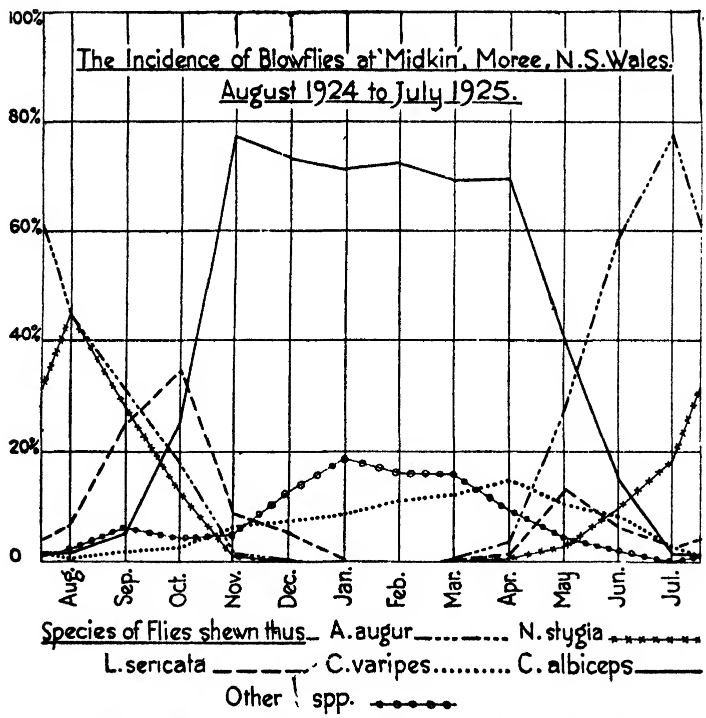
	A. augur.	*N. stygia.*	*C. albiceps.*	*L. sericata*
1924.				
August	5·1	23·5	18·5	14·6
September	7·7	27·0	7·0	10·2
October	6·9	19·0	9·2	20·4
November...	2·1	5·6	11·3	10·9
December	......	......	12·0	18·0
1925.				
January	......	......	18·3	9·9
February ... ... -- ...	......	......	21·6	25·5
March	6·2	......	15·3	15·6
April	2·8	17·2	13·3	12·1
May	1·8	6·6	13·4	13·8
June	3·5	11·1	20·2	18·6
July	4·1	17·2	15·4	13·2

The special record traps afforded data as to the incidence of the different species of blowflies during the year. Table III and Graph No. II show that *C. albiceps* is at its numerical maximum during the summer months, when it was easily the predominant species at Moree. *N. stygia* and *A. augur*, on the contrary, reached their numerical maximum during the winter months June to September, when they were the predominant species. *L. sericata* reached its maximum numerically during the spring months September and October, was almost absent during the summer months (*i.e.*, from January to March), and increased again in late autumn (*i.e.*, May). *C. varipes* also reached its maximum during the summer, but was never as numerous as *C. albiceps*.

TABLE III, showing percentage of each species out of total of all species caught in special record traps.

	A. augur	*N. stygia.*	*C. albiceps.*	*C. varipes.*	*L. sericata.*	Other spp	Total of all species
1924.							
August ...	44·9	44·5	1·0	0·7	6·5	2·2	9,615
September ...	31·0	30·3	4·9	1·7	25·1	5·8	14,158
October ...	19·1	13·8	25·7	2·1	34·8	4·3	18,892
November ...	1·5	0·8	77·4	6·2	8·7	5·3	25,928
December ...	0·2	0·2	72·8	7·7	5·7	13·3	15,540
1925.							
January ...	......	0·1	71·2	8·3	0·7	19·1	20,915
February ...	......	0·2	71·7	10·8	0·6	16·1	48,840
March ...	0·5	0·2	69·9	12·0	0·5	16·7	29,196
April ...	3·8	0·3	69·2	15·1	1·9	9·5	37,470
May ...	27·6	2·4	41·3	10·6	13·0	4·7	34,302
June	58·3	9·7	15·1	8·1	6·1	2·4	18,612
July	77·3	17·1	1·5	2·2	1·7	......	8,338

During January, February, and March, 1925, the fly attack was practically negligible; some slight infestation took place in April, and during May, June and July the flies gave little trouble. Table IV compares the percentage of each species of blowflies caught in the special record traps with the percentage of each species bred out from larvae taken from living sheep in the same month. It will be seen that the percentages from living sheep do not always approximate to those from the traps, suggesting that sometimes the flies are more readily attracted to the carrion in the traps than to the living sheep and *vice versa.* The percentage of *L. sericata* recorded attacking sheep is, on the whole, higher than the percentage recorded from the traps.



Graph No. II.—Monthly Percentage of Species of Blowflies caught at Midkin.

Valuable opportunity was afforded by the records kept at the station of observing any relationship between rainfall and temperature and blowfly infestation of sheep, and Table V presents some of these facts in juxtaposition.

The season was wet and warm in the spring and early summer, but from December, 1924, to July, 1925, was very dry, most of the rainfall shown coming in scattered showers of not more than half an inch, which dried up rapidly and were not sufficient to bring up any green feed. These conditions

caused severe fly attack from August to November, 1924, and into December, but from January to July, 1925, the fly attack was practically nil, apparently owing to the dry conditions prevailing, although some of the sheep shorn in August were carrying sufficient wool from December onwards to make them liable to fly attack. Other sheep were shorn in September and October, so that there were some sheep during the whole period with sufficient growth of wool to attract flies, and to indicate whether the conditions were conducive to fly attack or rot. It will be seen, however, from the table that the severity of the fly attack on sheep does not coincide with the period when (according to the trap records) the greatest number of flies were about. It would appear from this that flies may be present in large numbers, and that there may be sufficient length of wool on the sheep to favour fly attack, and yet during hot, dry weather conditions from January to April the flies may scarcely strike the sheep at all.

TABLE IV, comparing the percentage of each species caught in special record traps, with percentage of each species bred out from larvæ taken from living sheep during the same month.

	A. augur.		*N. stygia.*		*C. albiceps.*		*L. sericata.*	
	From Traps	From Sheep.	From Traps.	From Sheep.	From Traps.	From Sheep.	From Traps.	From Sheep.
1924.								
August ...	46·2	53·0	45·8	2·0	1·2	...	6·7	45·0
September	34·0	25·4	33·1	27·5	5·4	...	27·5	46·8
October ...	20·6	8·0	16·2	3·7	26·4	62·7	36·6	25·2
November	1·7	...	0·9	Nil	87·6	88·3	10·0	11·6
December ...	0·3	*	0·3	*	92·0	53·2	7·3	46·7
1925.								
January ...	Nil	*	0·1	*	98·8	Nil	1·0	Nil
February ...	0·1	*	0·3	*	98·7	Nil	0·8	Nil
March ...	0·8	*	0·4	*	97·6	Nil	0·8	Nil
April ...	5·0	16·5	0·4	2·7	91·9	53·6	2·5	27·1
May ...	32·7	Nil	2·8	Nil	49·1	Nil	15·5	Nil
June ...	65·2	Nil	10·9	Nil	16·9	Nil	6·9	Nil
July ...	79·1	Nil	17·5	Nil	1·6	Nil	1·8	Nil

* Fly attack practically nil.

Table VI shows the percentage of flies taken in various positions and classes of country. It will be seen that the percentages at each trap vary in an irregular fashion, but in a general way flies are shown to be more abundant in the timber, particularly during extremes of heat and cold. The presence of permanent water had little apparent influence on the prevalence of flies for the first six months, when the rainfall was abundant. During the dry months of February, March and April, when there was no water about the paddocks and no green feed, the trap records show that flies were more abundant near permanent water, both on open plain country and in timber.

TABLE V, showing total number of flies taken each month from special record traps, the rainfall, temperature, and amount of fly infestation on sheep.

Month.	Total Flies.	Rain.	Mean temperature 9 a.m.	Average Humidity at 9 a.m. daily.	Degree of Infestation on Sheep.
1924.		points.		per cent.	
August ...	9,615	157	56·4	No record	Fairly severe.
September ...	14,158	181	63·4	67	Severe, particularly in lambs.
October ...	18,892	172	70·0	57	Severe in unshorn sheep and lambs.
November ...	25,928	713	73·5	67	Shorn sheep free; severe in unshorn sheep and lambs.
December ...	15,540	Nil.	75·3	56	Shorn sheep free; some attack in August shorn sheep.
1925.					
January ...	20,915	325	77·8	65	Practically nil.
February ...	48,840	55	81·1	55	,,
March ...	29,196	191	72·4	59	Very light.
April ...	37,470	Nil.	65·8	59	Light.
May	34,302	218	56·1	75	Very light.
June	18,612	28	51·7	86	Practically nil.
July	8,338	130	46·2	70	,,

TABLE VI, showing percentage of flies taken at each of the special record traps.

	Open plain, away from water	Open plain, near bore drain.	In timber, away from water	In thick timber, near bore drain	In timber on creek bank.	At woolshed yards near timber and cottage
1924.						
August... ...	8·9	14·2	3·6	19·9	53·3	No records.
September ...	19·8	...	23·0	32·9	24·3	
October ...	21·4	15·3	28·7	13·3	21·3	
November ...	16·0	9·8*	25·4	17·3	31·3	
December ...	13·6	10·2	10·5	32·2	25·3	7·6
1925.						
January ...	19·8	16·4	37·2	19·0	2·7†	4·6
February ...	10·5	18·9	23·2	24·3	12·9	9·8
March	4·4	10·8	27·2	38·2	12·1	9·2
April	8·9	17·8	14·5	36·6	6·5	15·2
May	13·1	9·4	5·4	24·2	21·9	25·7
June	17·9	12·0	10·8	30·0	14·0	15·0
July	13·5	12·6	28·6	30·1	15·6	......

* Trap damaged by stock. † Trap obstructed.

Biological Data on Development of Blowflies.

Time did not permit of much research along these lines, but some observations were made.

During May, 1925, with an average temperature at 9 a.m. of 53 deg. Fah., specimens of *C. albiceps* and *N. stygia* were bred through in the laboratory under identical conditions. *C. albiceps* gave a total larval and pupal period of twenty-three to twenty-six days, and *N. stygia* twenty-two to twenty-four days.

Some other figures with regard to the length of the larval and pupal stages were obtained in August and September with an average 9 a.m. temperature of 59 deg.:—

		Days.
A. augur—	Larval stage	16–18
	Pupal stage	14–16
	Total larval and pupal	30–34
N. stygia.—	Larval stage	14–16
	Pupal stage	13–17
	Total larval and pupal	27–33
L. sericata.—	Larval stage	13–16
	Pupal stage	14–16
	Total larval and pupal	27–32

The figures for *A. augur* and *L. sericata* agree approximately with those already published by Johnson and Tiegs in Queensland.

In early November, with average temperature of 72 deg., *L. sericata* and *A. augur* gave total larval and pupal periods of twelve to fourteen and thirteen to sixteen days respectively. The latter figures are somewhat lower than those published by Johnson and Tiegs for *L. sericata* during the same month in Brisbane.

C. albiceps, early in December, with an average 9 a.m. temperature of 75 deg., gave a larval and pupal period of eleven to thirteen days, which figure agrees very closely with Johnson and Tieg's result for the same month.

During the development of various species of blowflies, the laboratory assistant, Mr. J. G. McDonald, reported that the "hairy" maggots of *Chrysomyia albiceps* frequently attacked and fed on the smooth-bodied maggots of the other blowflies. He also found that these smooth-bodied maggots avoided the hairy maggots, and that they were even driven in numbers from the meat on which they were feeding before they were full grown. These observations prove that the maggots of *C. albiceps* are sometimes predaceous.

Insects Found in Carcases.

The following are some of the insects found commonly under carcases on the North-west Plains:—

DIPTERA (Flies)—*Chrysomyia albiceps, C. varipes, C. micropogon, Anastellorhina augur, Neopollenia stygia, Lucilia sericata, Sarcophaga aurifrons, Australophyra analis.*

COLEOPTERA (Beetles).—*Creophilus erythrocephalus, Dermestes cadaverinus, Trox* spp., *Saprinus laetus.*

Predaceous and Parasitic Insects.

Of the beetles, the Histerid (*Saprinus laetus*) is the commonest species, and is usually found in large numbers under any carcase. It is interesting from an economic point of view, in that it destroys large numbers of blow-

fly pupæ, being, to this extent, predatory in its habits, but it is also a carrion eater, and feeds upon the decaying flesh.

The larva of *S. laetus* is a whitish or cream coloured grub, very active, tapering towards the head, and about 15 m.m. long and 1·5 m.m. broad. The prothorax and head are reddish brown, the legs small but well developed and the jaws strong and curved. When full grown they crawl into the soil and pupate, in some cases, where the soil is loose, forming earthen cells composed of particles of the soil stuck together. The pupa is cream-coloured, about 5 m.m. in length, with the outline of the future beetle plainly visible.

The adult is a small shining beetle 4 to 6 m.m. long and 3 to 4 m.m. broad. The upper surface of the prothorax and head is dark bronze; the elytra (wing covers) and upper surface of the abdomen dark metallic blue, with the legs and under-surface shining black. The lateral margins of the prothorax and the greater part of the elytra are finely punctured with four longitudinal striae on the basal portion of each elytra. The head is bent under the prothorax so that it cannot be seen from above, and is furnished with strong curved mandibles. The elytra are short, exposing the two terminal abdominal segments. The antennæ are clubbed, and the tibiæ of the fore-legs, and to a lesser degree of the other legs, are flattened and toothed, being adapted for digging through soil and decaying matter. The beetles are found at any time of the year, though they were most abundant from October to April, during which period the larvæ were also observed. Wherever a carcase was turned over in the field the beetles were found feeding on the decaying tissue or on blow-fly pupæ, but when accumulations of the latter occurred the adults were more plentiful there than on the decaying flesh. The larvæ were only seen feeding on blowfly pupæ. The larvæ were not able to penetrate the tough, spiny pupæ of *Chrysomyia albiceps*, but fed readily on the softer, smooth pupæ of *Anastellorhina augur*, *Nopollenia stygia*, and *Lucilia sericata*. The shell of the pupa is torn open by the aid of the strong jaws of the beetle larva, which feeds on the semi-liquid matter within. The adults can fly well, but their power of flight is not readily availed of in the day time. They must have a strongly developed sense of smell, as large numbers of them were caught in fly-traps out on the open plains within a few days of the trap being baited; any decaying carcase was also quickly found by them. The eggs were not observed, but minute newly-hatched larvæ were bred through in December, 1924, giving the length of the larval and pupal periods as follows:—

Larval period—5–8 days;
Pupal period—18–19 days.

Parasites of Sheep Blowflies.

Since 1914 seven parasites have been identified as attacking blowflies. These are *Nasonia brevicornis*, *Spalangia muscidarum*, *Paraspilomicrus froggatti*, *Chalcis calliphorae*, *Chalcis dipterophaga*, *Hemilexomyia abrupta*, and *Dirhinus sarcophagae*.

Of the above species, *Nasonia brevicornis* seems to be the most prevalent, and it has received most attention. Mr. Froggatt recorded it as early as 1914, and since then enormous numbers of this species have been developed by the Entomological Branch and distributed throughout this State. Large numbers have also been distributed in Queensland. Altogether it is estimated that some millions of the parasite have been artificially bred and sent out into our western districts during the past ten years. In spite of this there has been no noticeable general diminution of the blowflies, though they have been more prevalent in some seasons than others.

The evidence under field conditions has indicated that this parasite, even after being well established in a district, cannot be relied upon adequately to control blowflies. It seems possible that, though there may be a local increase of the parasite, yet over a number of years it does not exercise control.

The biology of *Nasonia brevicornis,* as worked out by T. Harvey Johnson and O. W. Tiegs, indicates that the egg requires about forty hours for incubation. During summer the pupal period of blowflies is limited to about four or five days, which means that the blowfly pupae need to be parasitised within two or three days of pupation or the parasite may not affect them. The workers named also point out that the parasite may not be able to reach all the blowfly pupae, and that it is not so prolific as the blowflies. Some of these factors may be sufficient to explain the non-success of this parasite in the control of the blowfly here under natural field conditions. During the progress of our experiments at Midkin, in the Moree district, in 1924-5, the following few observations of the amount of parasitism of *Nasonia brevicornis* were noted.

In December, 1924, 231,000 of pupae of *Chrysomyia albiceps* were developed for purposes of the range-of-flight test. Of these, it was found that approximately 5 per cent. were parasitised, yet the conditions were rather favourable for the parasite to gain access to these blowfly pupae, as approximately half of them were exposed on top of the sand in our trays. These larvae were noted not to regularly bury themselves in the coarse sand used.

In March, 1925, under similar conditions to December, 1924, a batch of 206,000 pupae of *Chrysomyia albiceps* were developed, of which approximately ·6 per cent. were found to be parasitised. Again, in May, 1925, 184,000 pupae of various species of sheep blowflies were developed, and of these about ·8 per cent. were parasitised. The mere fact that over half a million flies could be developed to the adult condition from pupae in open trays under conditions favouring parasitism by *Nasonia brevicornis,* suggests that, as a control, this particular parasite cannot be relied upon.

Holding the opinion that *Nasonia brevicornis* was not sufficient for control, we arranged to obtain from England a small supply of the parasite *Alysia manducator.* During April, 1925, we received a consignment of over 3,000 pupae of the European blowfly *Calliphora erythrocephala.* These

were obtained through the courtesy of Dr. Guy Marshall, F.R.S., of the Imperial Bureau of Entomology, and the bulk of them were sent in cold storage. They survived well, but did not yield a single parasite. However, from a parcel of thirty-three pupae forwarded through the post, some ten parasites were hatched out. These proved to be *Alysia manducator,* but we were not able to induce them to infest larvae of *Calliphora erythrocephala. Lucilia sericata, Anastellorhina augur,* or *Musca domestica,* which were presented to them. This did not indicate, however, that success may not be obtained with a further batch, and arrangements are being made for another supply to come to hand in the present year. It is hoped that this and other introduced parasites may be more effective in control than species already in the country and known to be widely spread which have not proven to effect appreciable reduction of the blowflies.

Summary.

1. Five species of sheep blowflies were found to be present in every month of the year, but great fluctuations in the relative numbers were recorded in this north-west district (Moree). During the summer *Chrysomyia albiceps* was predominant. During the winter *A. augur* and *N. stygia* (the yellow-bodied species) were predominant. *L. sericata*, one of the green species, was at its numerical maximum in spring and again in autumn.

2. Females were much more readily trapped than the males.

3. The blowflies may be present in large numbers, yet during dry, hot weather rarely attacked ("struck") the sheep.

4. Fly attack in sheep was found to be most severe after rain and during warm, humid weather, and therefore "struck" sheep were generally recorded when green feed and water were plentiful.

5. *Lucilia sericata* proved a more serious pest than was indicated by the comparatively limited number captured in the traps.

6. The blowflies were more abundant in timbered than in open country during the extremes of heat or cold; and were more abundant near permanent water in either class of country during dry weather.

7. The periods required for blowflies to pass through the larval and pupal stages varied from 22 to 32 days in the cooler months to 11 to 16 days during the warmer months.

8. The evidence points to the parasite *Nasonia brevicornis* being inadequate for control of blowflies under field conditions, even when supplemented by artificially bred parasites. The introduction and trial of parasites from abroad is advocated.

9. It is found that the maggots ("hairy") of *Chrysomyia albiceps* will feed on the smooth-bodied maggots of other blowflies, though they feed mainly on carrion or the sheep they infest.

10. The Histerid beetle (*Saprinus laetus*) is not only a carrion eater, but both the larvæ and adults feed on the pupæ of blowflies.

The Culture of Asparagus.

A Neglected Industry.

A. J. PINN, H.D.A., Special Agricultural Instructor.

THE demand for the product, the prices obtained for it, and the disparity between the amount grown locally and the amount consumed, all constitute reasons why the acreage of asparagus in New South Wales should be substantially increased. During this season a record was established in the price for the fresh article, up to 3s. 6d. per bunch being obtained for the first consignments from Emu Plains. The average price, of course, was below this, and dropped as supplies became available from the tablelands, where the bulk of this vegetable is produced, but it must still have been satisfactory to the growers. The readiness of week-end motorists to purchase the fresh article has enabled one grower in the vicinity of Sydney to add appreciably to the revenue received from his land.

So far the whole of the crop can be disposed of in its fresh state, but there are also decided possibilities in the production of asparagus for canning. Practically the whole of the canned asparagus on the Australian market is imported, about 100,000 cases, containing two dozen tins, coming in annually, and the quantity is tending to increase. The duty (imposed for the protection of local producers) amounts to 8s. 6d. per dozen large tins, and reference to the wholesale prices certainly suggests that canned asparagus is a proposition into which local growers and manufacturers might advantageously inquire.

The question of availability of labour during the cutting season demands consideration in connection with the planting of an area, but there should be little difficulty in securing full requirements, inasmuch as the work is sufficiently light to allow of the employment of the younger folk. The cultivation of the crop might, therefore, be considered as particularly suited to the man with a family, but the fact that the areas at present cultivated in this Sate are mostly dependent on hired labour, and that additional land is yet being planted to the crop by growers with established areas, indicates that others who have not previously considered it as a revenue producer might devote some attention to it.

The greatest drawback confronting the prospective grower is the fact that returns are not available for some years; but it should be remembered that once it is established the period of profitable production is of many years duration, provided proper attention is given to the cultivation and use of fertilisers.

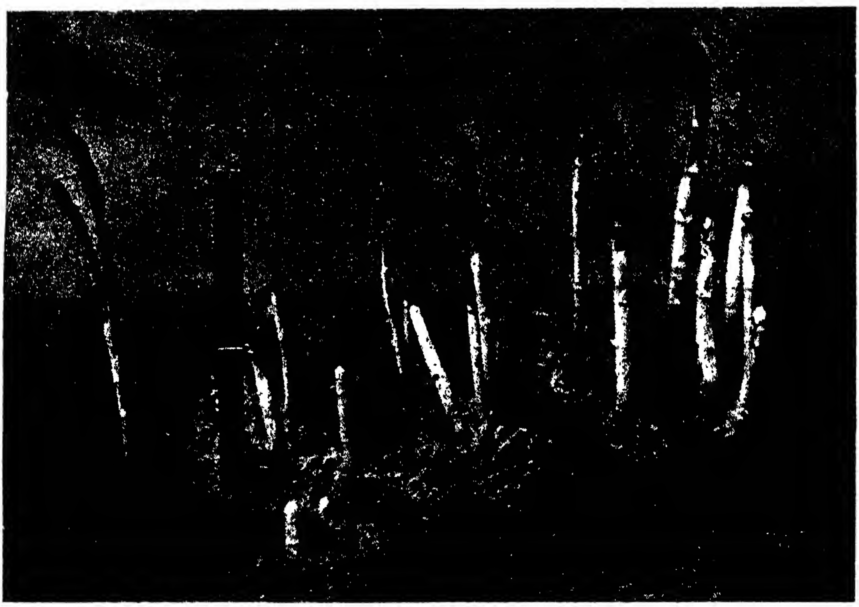
What Asparagus Is.

Asparagus is a branching herbaceous plant, attaining a height of 5 to 6 feet. It is perennial, possessing a large root-stock and fleshy roots, in which it stores nutriment to tide it over the winter. It is upon the vigour of this root-stock and root system that its value depends, for it is these that enable

it, on the return of the warm weather, to send up the tender young sprouts that make a delicious vegetable. The two popular varieties are Connover's Colossal and Palmetto.

Suitable Soils.

Asparagus can be grown on a variety of soils—in fact, any that can be made into a good garden loam. It thrives best upon sandy loams, moderately deep, and rich in vegetable matter. River-flat lands that are moist and well drained are considered ideal. Heavy clays, and those with a hard-pan, or any that are cold and wet, should be avoided. Soils containing stones are undesirable, as they interfere with the cutting and



A Prolific Plant

The growth from a 14-year-old plant. The earth has been scraped away to show the number of shoots since the cut two days previous.

cultivation. As asparagus requires all the sun it can get, the land should have a northerly aspect, and should not be shaded by trees and shubs. It responds well to irrigation.

Soil which has been worked deeply and manured heavily with farmyard manure for root crops, and kept free from weeds, is most desirable. Asparagus is a deep-rooting plant where the conditions are favourable, and the land should be subsoiled to a depth of from 18 to 20 inches, unless it is loose and friable to that depth. The old method of trenching to a depth of 24 to 30 inches is not practicable in field culture, nor is it necessary. The land should be thoroughly worked during the autumn and left to mellow during the winter, when it should be again ploughed and drilled ready for the reception of the roots in the early spring.

The raised-bed method, as generally practised in garden culture, is not to be recommended under Australian conditions, and is only permissible where an abundance of moisture is ensured. Flat field culture has much to recommend it.

Districts.

The earliest asparagus is produced in coastal districts, but cultivation within this area of the State is attendant with much more trouble from weed growth than in tableland districts. This fact is worthy of early consideration by persons contemplating planting the crop on a commercial scale in coastal districts, as it will be necessary to consider the increased labour requirements necessary throughout the year in controlling this weed growth.

While the metropolitan market is undoubtedly the main market, there also exist many local centres where considerable quantities could be disposed of. There are few agricultural areas in New South Wales where a small area should not prove profitable, even if only for supplying the local trade of the district in which the grower resides.

Tableland districts with rail communication to Sydney offer the best scope for the cultivation of the crop on an extensive scale.

Raising the Plants.

Fresh seed should be sown in well-prepared soil in spring, at intervals of 4 to 5 inches, in drills about 2 feet apart. Germination is slow, but it may be hastened by soaking the seed in warm water for twenty-four hours. Cover about 1 inch deep. The land should be well worked and kept free from weeds. By liberal treatment vigorous yearlings are produced.

The seedlings should be set out from the nursery just prior to the new growth in the following spring, care being taken not to expose the roots to the sun or drying winds. Only strong-growing plants should be used. Select those that have the thickest, most succulent, and most vigorous stems. Choose tall rather than shrubby plants. Vigorous yearlings are much to be preferred, but if two-year-old plants are used, only those with imperfect flowers which do not bear seed should be selected. Seed-bearing is exhausting, and the annual shedding of seed—with its consequent crop of asparagus seedlings—constitutes one of the greatest "weed" difficulties which has to be contended with in the cultivation of this crop.

By keeping the young plants in the nursery for two years it is possible to eliminate seed-bearing plants before planting in the permanent bed takes place.

The soil in the nursery should be of a sandy texture if possible, as a better root development is then produced, and the young root crowns can be dug with the minimum of injury.

When using home-grown seed it should be remembered that each small red berry contains a number of seeds (as many as six), and before sowing it is advisable that the berry coats should be freed from the seed. This is accomplished by placing the berries in a small sack and beating with a stick.

If the whole is then placed in water the seeds will sink while the berry coats will float, and can easily be separated. A pound of seed contains approximately 20,000 seeds.

Planting Out.

As the beds or fields will, with proper care, last a considerable number of years, it is important that the planting out be done carefully, and sufficient room be left for root expansion. In rich, moist soils the land should be marked off in drills 4 feet apart each way, and the roots set in their intersections. In light soils they may profitably be planted 5 feet each way. This allows of cultivation both ways, which is a consideration in the eradication of weeds and conservation of moisture. The drills should be opened out about 9 inches deep and the roots set in the bottom, care being taken to keep the crown upward, and to spread the roots in their natural positions. The crowns should then be covered by 2 or 3 inches of soil. If "blanched asparagus" is required the crowns should be placed about 6 inches below the surface; if "green asparagus" they should be planted shallower. The natural growth of the crown forces it towards the surface, and the original depth can be maintained by applications of abundance of farmyard manure or by cultivation so as to work a greater depth of soil over the roots.

After-treatment.

After the asparagus plants have been planted out in the spring, the land should be kept free from weeds throughout the summer, and frequently cultivated to conserve moisture. When the stems turn brown they should be cut down and either carted off or burned on the beds or fields. The land should be thoroughly cultivated, and where possible a liberal dressing of well-rooted farmyard manure applied; this can be done more economically during winter than in the spring. Early in the spring the land should be again thoroughly cultivated, and any artificial fertiliser used should be applied then.

The summer cultivation must be continued each year, as it is most important. During the summer months the plants are preparing fresh stores of food in their roots and require liberal treatment; neglected plants are longer in becoming remunerative. Each autumn the stems should be cut off before the seeds fall, and either removed or burned on the spot, as stated above. Where practicable, it would be wise to go through the plants and cut out all seed-bearing stems before the whole of the top growth is cut down. Subsequently, the bed should be treated as during the first year.

Cutting.

Old-established roots can be cut for about ten weeks before being allowed to run up to stem and leaf. Younger roots must be cut lightly, and it is better not to make a cutting till the fourth spring. Throughout the cutting season the small as well as the marketable shoots should be cut clean away; otherwise they exhaust the roots, and reduce the marketable output. The field should be gone over and the shoots cut each day, as the leaf-buds, which form the tip, should not be allowed to open before cutting.

The method of cutting varies with the demands of the market. If "blanched asparagus" is required, it should be cut when the tops show above the ground, and about 8 or 9 inches below the surface; this system necessitates the earth being ridged over the crowns. In cutting, care should be taken not to injure other ascending shoots. For "green asparagus," the shoots are cut when about 7 inches high, cutting about 2 inches below the surface. An intermediate method is to cut when about 4 inches high, and about the same distance below the surface; the product is then half white and half green.

After cutting, the stalks should be subjected to as little exposure as possible in the fields, and any dirt should be rinsed off. If the bunches are to be kept overnight, they should be dipped in clean water and stood on end upon clean straw which has been thoroughly wetted. The bunches should be from 8 to 9 inches long, and tied with raffia, fibre or string. If for local market, one string is sufficient; if to travel any distance, two are preferable. The stalks should be graded into different qualities.

Manuring.

Asparagus, to be profitable, should be forced, and quick-growing, succulent shoots should be aimed at. To ensure these, the manuring must be liberal. Large quantities of farmyard manure mixed throughout the lower layers of the soil are not necessary, excepting when required to ameliorate heavy soils. Fifty or sixty tons of well-rotted farmyard manure to the acre is a fair dressing, and can be applied most economically after the stems are taken off in autumn. It should be well rotted previously, to destroy seeds of weeds. Applications of commercial fertilisers should be made in the spring, directly after the cutting is finished, and prior to cultivation. Applications of the following have given good results upon many soils:—250 lb. nitrate of soda, 400 lb. superphsphate, and 150 lb. muriate or chloride of potash per acre.

Common salt is now but little used by commercial growers; the application of such manures as nitrate of soda and chloride of potash to some extent takes its place.

While heavy applications of farmyard manure are desirable, the cultivation of the crop can be and is successfully carried out in some districts without the annual application of manure by substituting spring dressings in larger quantity of artificial fertilisers.

Spent tan bark is found useful as a mulch when farm manure is not available, and has been found of great benefit on some soils which have a tendency to surface compaction. Mulching of this type is of particular use when irrigation is not practised, and helps considerably in reduced trouble from weed growth.

Instances are known of great longevity of asparagus plots—one stand being over fifty years old—but it can safely be said that with ordinary care on a commercial plantation, a minimum of twelve years' production should be secured.

Farms, Forests, and Tree Lots.

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MANY of us are apt to overlook or forget the importance of tree life or forest cover in maintaining the fertility and prosperity of a country. The man in the street recognises that forests supply us with timber, fuel, and other products which play an important part in the machinery of everyday life. But he often overlooks the big part they play in regulating stream flow, in preventing undue erosion of the land surface by rain and wind, in reducing evaporation, in rendering climate more equable, in helping to maintain a public water supply, in preventing the silting up of reservoirs and watercourses, and in providing breakwinds for large areas.

The prosperity of farm lands depends, to a large extent, upon the maintenance of forest cover on certain areas. At times the land-owner is prone to regard tree life as cumberer of the soil, and this attitude is readily understandable in a young country where the process of clearing is essential for the progress of settlement. Forest growth under such conditions is a hindrance, but this attitude has persisted long after the reason for it has vanished.

Forest Denudation and Land Erosion.

It is in the effect of forest denudation upon erosion of the land surface that we have the most striking example of the close connection between forest cover and prosperous farms: Erosion is one of the worst enemies of the farm, and forest cover is one of the best means of combating it. Under forest conditions on elevated lands, the rainfall is absorbed gradually into the subsoil, finally making its way out at a lower level to feed gently-running streams and springs. On the destruction of timber the surface-soil becomes hardened and is unable to absorb the rainfall. This rushes off on the surface, resulting in ever increasing erosion. On forest soil the rainfall flows *under* the ground, but on treeless soil the water is carried off mainly *on* the surface.

Removal of forest cover on elevated land, particularly on the watersheds of stream systems, results in increased erosion and floods. Some years ago Elwood Mead stated that, as a result of the removal of forest cover in the Alleghany Mountains and in the watershed of the Mississippi River in the United States of America, "the fertile soil was scoured from the hill-sides by the unrestricted run-off of the rainfall, and the rivers silted up to such an extent that their navigation in summer was rendered difficult, and their flow so impaired that rice-growing on the Atlantic seaboard had almost ceased." The Hunter River also provides an example of how the removal of forest cover has resulted in the silting up of the river bed and in disastrous floods.

The effects of erosion are not limited to the more spectacular and obvious forms of channeling, but are often imperceptible. The finer and more fertile particles of soil are slowly washed away, the land gradually becoming more impoverished without the farmer realising the real cause of its deterioration. On areas denuded of forest cover the rain runs off rapidly and unchecked, bearing considerable quantities of silt and debris. This is carried down to the lower reaches of the river, resulting in a silting up of the bed of the stream and a covering of the fertile flats with loose debris. Owing to the increased run-off and the shallowing of the river-bed, floods become more common. Irrigation, especially from natural rivers, is interfered with, as the removal of forest cover has resulted in floods in winter, when water is not needed, and intermittent stream flow in summer, when a steady supply of water is required. Artficial reservoirs are silted up, and the lessening of stream flow during summer months results in interference with navigation and loss of water power.

The erosive action of wind is also hindered by forest cover. Where excessive clearing is carried out in areas where light soil predominates, wind action may result in erosion of the soil and the formation of drifting sands. Down through the pages of history we can find many examples of where the sweeping away of forests has resulted in the destruction of the farms. The farmers of north-western China took no heed of forest conservation —to-day a big area of denuded forests and farms is the result. In Palestine, Syria, and Greece forests were destroyed indiscriminately, and the farmers were driven out by flood and drought.

Clearing of non-agricultural land, particularly on higher elevations, is often the cause of unnecessary erosion. Such land has often the virtue of being cheap; the settler remains for a time, and, finding that the ground quickly becomes too poor for agricultural use, moves on to another place. But the damage has been done, in that the area has been cleared and laid bare to the action of rain and wind.

What the Forester Asks.

The forester does not ask the farmer to yield him the best land; he would give to the farmer and pastoralist all land that would be a paying proposition and would be content with the balance. Inferior land often shows surprising ability for growing trees, as the soil requirements of a forest crop are not the same as those of an agricultural one. As the result of experiments by a German scientist, it was demonstrated that:—

(1) Substances required for the growth of forest trees are qualitatively the same as those required by field crops.

(2) While some species of forest trees require for the production of leaves and wood quantitatively nearly as much mineral substances as an average field crop, yet other species, especially conifers, require only one quarter the amount of an average field crop.

(3) For production of wood alone (leaves excluded) forest trees require much smaller quantities than the field crops. Of the rare substances, such as potash and phosphoric acid, trees take on an average only about one-twentieth the quantity required by field crops.

(4) Almost any soil can furnish a sufficient quantity of mineral substances for the production of a crop of trees, provided leaf mould is not removed.

The land resources, therefore, of a country could be divided into two distinct sections—firstly, agricultural and pastoral, and, secondly, forest lands. By maintaining forest cover on catchment areas, as windbreaks where soil-drift might be expected, and on areas unsuitable for profitable agriculture, the land resources of a country might be most fully utilised.

Tree Lots on the Farm.

This separation into agricultural and forest lands might also be profitably carried out on the smaller unit of an individual farm. On most areas there are certain portions which are not profitable as agricultural lands on account of poorness of soil, steepness of the slope, &c. These areas are really not paying their way, and could be used more profitably as tree lots. The advantage of a tree lot on the farm is considerable. In America the "wood lots" on each farm are tended just as carefully as any of the other farm crops. In the southern States farm woodlands represent more than half the entire forest land, and yield annually 94,000,000 dollars of timber products.

A tree lot on the farm has many practical advantages. Such an area would provide all fuel, wood, fencing material, poles, and any timber required for the homestead and outhouses. Operations are sometimes suspended until suitable timber can be sent for. Many farmers have to cart even fuel considerable distances. Timber is both bulky and costly to transport, and it is therefore a matter of commonsense to have a supply available for the needs of the farm. Such tree lots can take the form of windbreaks or shelter belts for stocks and crops, planted at right-angles to the direction of prevailing winds. They may be so placed as to prevent erosion of the land surface on steeper slopes. Handled correctly, they are useful in enriching the character of poor soils; they provide a breeding place for useful birds, they exercise a local effect on climate, and have a real aesthetic value. The appearance and comfort of an individual farm would be wonderfully enhanced by a group or belt of trees. In addition, the tree lot can be a source of revenue to the farmer, through the sale of fuel and timber, or some such side-line as wattle bark, the maintenance of the area providing employment for slack periods during the year.

The establishment of such an area on the farm is not a difficult matter. If the property is already timbered, the indigenous species can be handled in such a way as to preserve a very useful tree lot. When a new farm is being carved out of the virgin country the settler can so carry out his clearing as to leave suitable belts of timber for windbreaks and shelter trees. In addition, in parts which are least suitable for agricultural pur-

poses, he could leave the best trees standing as the nucleus of his plantation. Unfortunately, the settler too commonly destroys practically all the trees on his area, and where an area has been completely cleared or where very little natural tree growth occurs, planting must be resorted to. In selecting the site for a tree lot consideration must, of course, be given to the various features previously mentioned, but when everything else is favourable, a group of trees close to the homestead has a very pleasing effect. The cost to a farmer is represented by little more than his own time. Any spare time during slack seasons can be devoted to such work.

Choose Suitable Species.

The choice of a suitable species or number of species is a matter of considerable importance, as any error of judgment at the commencement is liable to prove very expensive. A mistake may not be recognised for many years, as the early growth of a tree is no sure indication of its subsequent suitability. Some may flourish for ten or fiteen years and then commence to deteriorate. A selection should be restricted to species whose success in a given locality has either been proved or well assured. As a commercial proposition, the growth of *Pinus insignis* is often recommended in districts where the rainfall does not fall below 20 inches, and the soil is of fair quality. *Pinus pinaster* may be grown on poor, sandy soils. As a conservative estimate, the yield from a crop of *Pinus insignis* in thirty years is 6,000 cubic feet of sawn timber to the acre, which, at 6d. per cubic feet, would return £150 to the acre.

Australia seems to be faced with a soft-wood famine. Our natural resources of soft-woods, never very great, have now been almost exhausted, so that we are dependent almost entirely on imported timber. In roughly thirty years' time a world shortage of softwoods is expected, so that the growth of home supplies is becoming imperative. Although there appears to be some doubt as to the suitability of *Pinus insignis* for first-class timber work, the almost inevitable shortage of soft woods throughout the world will result in a high price for even second-class wood. For general work on the farm, *Pinus insignis* is quite suitable, and is of especial use for the making of cases, as the wood is not easily split by a nail.

Wattle culture might be recommended for certain areas. *Acacia pyncantha* will grow on poor soil and under a comparatively low rainfall, and yields one of the most valuable tanning barks in the world. Australia is apparently in the process of becoming dependent on the outside world for supplies of one of its own native products, as the following figures indicate:—

Year 1923-24.	
Exports tan bark	17,529 cwt.
Imports tan bark	93,769 „
Excess imports over exports	76,240 „

The greater part of the imports consist of wattle-bark from South Africa, where the growing of Australian species of wattle has assumed considerable

commercial importance. Favourable soil conditions and cheap labour have done much towards establishing the Natal industry, but the main reason for the drifting of the industry away from Australia appears to be that in the past we have relied too much upon naturally-occurring trees, and have not paid sufficient attention to the establishment of plantations. As a forest industry, wattle growing is unique, in that it gives returns within a few years, the bark being ready for stripping within five to ten years. It is estimated that 5 tons of bark can be obtained to the acre. Stripped trees may be used for fuel or for small timber purposes.

In the past, the amazing thing has been the way in which the settler and the pastoralist have destroyed practically all tree life on their holdings in order to make "two blades of grass grow where one tree grew before." Standing trees, within limits, do not interfere with the value of land from a pasture point of view. At times sufficient trees for shade or shelter purposes have not been left, although such shelter not only affects the general health of animals, but decreases the loss of sheep, particularly during lambing and shearing.

In districts subject to bleak and piercing winds during the winter months, strips of trees should be planted out at right-angles to the direction of the prevailing wind. Properly handled, these will become, in the course of time, not only breakwinds, but also the source of supply of timber for domestic purposes. Out in our western districts trees undoubtedly improve pasture land, apart from their shade and fodder value. When denuded of trees, the surface soil is swept away. Moreover, the leaves provide a litter in which the seeds of native grasses lodge and find a suitable seed-bed.

In connection with the establishment of tree lots on the farm, it may be argued that the farmer will not reap the direct benefit of his sowing, owing to the long periods necessary for the maturity of a forest crop. In the first place, the farmer will probably only plant species which are quick-maturing. In the second place, he will have the benefit of all thinnings, which, after the first five to ten years, are not inconsiderable. A well-established tree lot would, moreover, be a decided asset should the owner wish to sell his property.

In the past the farmer and landowner have usually regarded tree life as something to be destroyed. To-day there appears to be a general public awakening to the importance of forestry work, and the farmer might, with advantage, realise that in forestry work agriculture has a partner by whose aid the resources of the State as a whole, and of the farm as a unit, can be most fully utilised. Tree lots on the farm are æsthetically an improvement, and practically a decided asset, and the cost of their establishment and maintenance is comparatively small. Shire and municipal authorities might well consider the advisability of establishing on areas handy to country towns plantations of suitable trees, which would eventually prove a source of revenue, a recreational and educational reserve, and a picturesque setting to towns which too frequently are drab, dusty, and unlovely.

Batlow and Its Possibilities.

WITH the object of stimulating the interest of his staff in the agricultural and pastoral resources of the districts served by their respective stations, a competition was recently promoted by the Southern Area Commissioner (Mr. J. Reid), New South Wales Government Railways, in which railway officers were invited to discuss the salient features of their districts from the standpoint of production. It was suggested that the writers might enlarge on such points as the extent of the various activities, the value of the products, the methods employed, and the potentialities of the district in other directions, not necessarily agrarian. The standard of the essays submitted was high, and the prize of two guineas was ultimately awarded to Mr. L. Bailey, stationmaster, Batlow, whose statement of the resources of that district was thought to be sufficiently comprehensive to form a useful model for others who contemplated similar essays. We are indebted to Mr. H. P. Harris, Outdoor Assistant to the Southern Area Commissioner for the opportunity of publishing the paper.—ED.

BATLOW is a coming fruit district, prettily situated midst surrounding hills whose valleys contain rich volcanic soil eminently suited for the production of fruit and, incidentally, vegetables.

In its early days Batlow was known as Reedy Flat, and gold was discovered in the creeks about 1853. Alluvial mining was carried on for about thirty-five years, when, as the gold was petering out, the miners turned their attention to farming. Many of them already had small plots of vegetables, with a few fruit trees, and some even grew sugar beet, from which they obtained sugar and treacle. Supplies took many months to arrive, having to be brought by bullock team or dray from Sydney, or the nearest railhead—Campbelltown, Goulburn, or Cootamundra as the railway progressed into the country—and in the very early days by packhorse for the last part of the journey. Therefore, the settlers grew most of their own household requirements, grinding their own flour from the wheat by hand or water power. Even in those far-off days Batlow fruit was known as far away as Gundagai and Cootamundra for its long-keeping qualities, and these early orchards formed the nucleus of the present-day fruit industry.

There are some 25,000 acres of first-class soil, and 20,000 acres of second-class quality and good grazing land. As is characteristic of granite and diorite land, these qualities are mixed. The soil being volcanic is rich dark basalt, and eminently suited for the production of heavy crops of fine fruits, principally cool-climate fruits, and berries. It has a deep friable clay subsoil which, while not so rich as the topsoil, is yet rich enough to continue growth in the trees, which thus grow larger here than in most other fruit-growing districts where the subsoil is not so good. Being friable there is good drainage, and the fruit grows to a good marketable size even in dry

years, and is well coloured. The trees come into bearing about 5 or 6 years old. The principal sorts of fruits grown are apples, pears, plums, prunes, cherries, with a few quinces, peaches, and grapes.

In 1923 there were 106 orchards of 1,978 acres, containing about 93,000 bearing trees of all varieties and 55,000 non-bearing trees, making a total of 148,000 fruit trees planted in the Batlow district, including the soldiers' settlement at Kunama. Two of these orchards contain 100 acres each. In 1907 there were only seven orchards, with about 5,000 trees. Many growers planted heavily for the export market, and, generally speaking, good results have been obtained from this source. During this present season about 1,500 bushel cases of apples and 2,894 trays of pears have been exported to England from Batlow, and a small trial shipment of 196 cases of apples and 418 trays of pears was sent to Canada to test the market there.

The total acreage in 1923 was 1,978 acres, including Kunama, of which 1,263 acres were bearing trees, and 715 acres non-bearing. Generally the trees are planted about seventy-five to the acre, being placed 24 feet apart. It is a good cherry district, as most of the cherries ripen about Christmas, when the market is practically bare of cherries. Peaches also find a late market, and the late kinds carry well.

Prior to the advent of the railway, growers were at a great disadvantage in having to cart their fruit over 15 miles of rough roads to Gilmore, and as year by year the production was increasing, it was becoming impossible to obtain sufficient teams for the work. But since the railway arrived things have considerably improved. A co-operative cool store has been erected, which had an original capacity of 8,000 bushel cases. Already this store has been enlarged once, making its present capacity 14,400 cases, with thirty-three shareholders, and a further addition is contemplated, which will bring the capacity to about 23,000 bushel cases. By this means the marketing period is extended to about nine or ten months, with better prices, instead of the fruit having to be rushed off in two or three months, and thus causing heavy gluts and low prices.

A co-operative packing shed has also been formed, which is the most modern and up-to-date in the Commonwealth, and handles the fruit for twenty-four shareholders owning 625 acres of orchard A standard pack is hereby assured, and the buyer can rely upon the case of fruit containing fruit according in quality with the specified brands.

Considerable quantities of prunes are also produced in the district, about 47 tons having been despatched in one year. No fertilisers are used for the fruit trees. Provided sugar, tinplate, and other requisites could be landed at Batlow at a reasonable price, jam, canning, and other factories could be erected also to utilise the waste products.

The yield of apples and pears varies, according to the variety, from four to six cases per tree at about 7 or 8 years, to ten to twelve when in full bearing. There is no fruit fly here, and care is being taken to prevent it coming.

There is still a considerable quantity of land, both Crown and privately-owned, available for settlement, both for orchards and mixed farming.

Besides fruit, Batlow grows excellent crops of potatoes and turnips, while good crops of sound and long-keeping onions have been grown. The yield of potatoes varies from 4 to 8 tons, according to the class of soil and climatic conditions, while record crops of 14 tons have been dug in new ground in good seasons. Also 40 to 50 tons per acre of turnips have been grown. About 2 to 2½ cwt. superphosphate per acre is sometimes used with potatoes, and perhaps ½ cwt. superphosphate where oats is cropped successively from the same ground. Some farmers spell their ground, growing a crop of potatoes, then oats, then leaving it idle for a year or two. Some good crops of oats and wheat have been harvested, up to 4 tons per acre for hay, with an average of 2 tons, while 60 to 90 bushels of oats for grain have been obtained. Wheat is better for hay than grain, being soft like English-grown wheat. The soil and climate are excellently suited to the production of high-grade barley. Yields of 25 to 30 bushels of maize have also been grown, the quick-maturing varieties doing the best on account of the early appearance of frost. The whole of the fodder produced is consumed in the Batlow district.

Cabbages, peas (both field and garden), and root crops grow to perfection. Hops also thrive excellently, and yield well. Batlow has a great advantage over many other districts with regard to market gardening, in that the vegetables thrive here when crops in warmer climates are practically finished, and Batlow's vegetables should therefore find a ready sale in the hot Riverina summer. Such fodder crops as field peas, horse beans, rape, and Sudan grass may be grown, being useful in rotation with other crops. Lucerne also grows well, yielding five or six cuts in the summer, when green feed is needed for the cattle.

Pigs do very well, as most of the feed can be grown, and they are almost a necessity on an orchard to consume the waste fruit. A few sheep and cattle, besides pigs, may be profitably carried as a side line, but the natural pastures are not so suitable for dairying as in other warmer districts unless they are laid down in English or other milk-yielding grasses. There is a luscious growth in the spring, which with hand-feeding for the winter months enables a settler to obtain his own milk and butter supply. The mountain pastures are very useful to the hot Riverina in drought time, however, being eagerly sought for by graziers as drought relief country, droughts as ordinarily experienced in other parts being practically unknown in Batlow.

Batlow lies close to the famous Bago Forest, of 110 square miles, a vast expanse of mountain plateau. There are four mills operating at the Batlow end, one of which has been working for over forty years, and producing to its full capacity. The chief timbers are mountain ash, messmate, and gum. When thoroughly seasoned, mountain ash is a light, tough wood, capable of withstanding a tremendous strain. It has been successfully used in cabinet work and the construction of aeroplanes, besides boat oars and implement handles of many kinds. It is similar in colour and grain, when wrought, to English oak; messmate is a heavier, finer-grained wood, but with less resiliency than ash, although it lasts better in the ground. Until

the coming of the railway the timber industry was under great disabilities, but now transport facilities have considerably improved, and millers can load on to trucks with comparatively little carting. A considerable quantity of timber (163,440 feet) has been trucked from Kunama, in the soldiers' settlement. One of the mills manufactures principally boat oars and handles, while the other three cut building timber and fruit cases, which are supplied to the Batlow fruitgrowers in shooks. When well seasoned, ash, messmate, and gum may be used for these cases, but ash is the best. Mountain ash only grows at an altitude of 3,000 feet and over. It is estimated that 8,000,000 super. feet per annum may be cut in the Bago Forest. The elevation of Batlow is 2,300 feet to 3,000 feet, the soldiers' settlement being higher than the main part of the district, while the forest rises in parts over 4,000 feet.

As the timber is cut out of the Bago Forest the ground is cleaned up, and a reafforestation scheme has been started, whereby the mountain ash is encouraged to rehabilitate itself in the higher altitudes, while in the lower parts blocks of Oregon pine or Douglas fir and *Pinus insignis,* two very useful soft woods, are being planted. A nursery has been established in the forest about 8 miles from Batlow, where the young trees are being raised.

The Batlow Soldiers' Settlement (Kunama) was established in 1917, and contains thirty-seven blocks of 40 to 60 acres. Here returned soldiers have been established, houses built for them (of local timbers), and 10 acres of each orchard on each block cleared and planted with apples, pears, and prunes, which are now reaching bearing age. Some of the settlers also grow potatoes and turnips as side lines. Water can always be obtained by sinking a short distance down, and 95 per cent. of the blocks have permanent creeks of varying size. The future holds everything in store for the man who is willing to work.

The Batlow railway was only opened in December, 1923, and the returns for the first six months of 1924 show that a very satisfactory business has already been done. From January to June a total of 43,500 cases, or 1,187 tons 10 cwt., of fruit of all varieties were despatched. Of this quantity 3,800 cases, or 95 tons, were sold direct in Sydney, including a small quantity for export. Taking the average price as 10s. f.o.r. Batlow per case, this represents a value of £23,750 on the fruit grown in the Batlow district. About 19 tons of prunes were also despatched, which at an average of £75 per ton represents a total of £1,425. About 1,600 bags, or 100 tons, of potatoes were forwarded from here, which at about £8 per ton shows a revenue of £800. A considerable quantity of timber was sent from Batlow, amounting to 73,000 feet super., or about 23 tons, with 2 tons of boat oars and handles. During the same period there were also despatched from Kunama 82,800 feet of timber, or 230 tons. A few sheep being run as side lines resulted in 40 bales of wool being placed on rail at Batlow.

The inwards tonnage amounted to 776 tons, and the outwards tonnage to 1,343 tons. Passenger tickets issued numbered 917. The coaching revenue amounted to £1,192, which with a goods revenue of £1,864 gives a total revenue of £3,056 for the first six months of 1924.

In comparing this period with the corresponding period for 1925 it will be seen that the district is prospering, a larger business being done in practically every line of production. The quantity of fruit despatched totals 80,400 cases, or 2,010 tons, or nearly double that of last year, and this at 10s. per case represents a value of £40,200. Of this quantity, 8,100 cases, or 205 tons 10 cwt., were direct sales, being more than double that of last year, the balance of 72,300 cases, or 1,807 tons 10 cwt., being forwarded to agents for sale. This amount includes 1,696 cases of apples, and 3,312 trays or 1,104 cases of pears for export. There was also a considerable increase in the quantity of prunes, 26 tons being despatched in 1925, which, at £75 per ton, gives a return of £1,950 for the district. The amount of wool remained the same, 40 bales, it not being a sheep-breeding district.

Potatoes also show an increase, 2,900 bags, or 181 tons 5 cwt., being produced; this, at about £8 per ton, gives an income of £968. As Kunama became more accessible the quantity of timber forwarded from Batlow itself decreased to 33,000 feet, while that from Kunama increased to 163,440 feet, or 454 tons. There were 87,840 feet of case timber loaded at Kunama, chiefly for Batlow growers. With the increase in the production there was an appreciable increase in the railway revenue. Inwards tonnage amounted to 1,055 tons, and outwards tonnage to 2,300 tons. Tickets sold, 841. The net coaching revenue totalled £1,464, and the goods revenue £2,752, or a grand total of £4,216, an increase over the corresponding period of 1924 of £1,160.

Besides being within easy reach of the Riverina for fruit and vegetables, Batlow should also be the tourist resort of the south. Its summer climate is ideal, healthy and cool, with a keen bracing mountain atmosphere, no hot nights, no mosquitoes, and very little hot wind. In winter there are slight falls of snow. There are several falls and picturesque resorts within easy access, where beautiful and extensive views are obtainable of the surrounding mountains and valleys, with their varied shades of colouring, from the rich dark chocolate of cultivated ground, with its attendant changes in hue as the season advances, backed by the vivid greens and reds of the native trees and paddocks, the snowy blossoms of the fruit trees in spring, with greens of diverse shades later, to the blending of the exquisite autumnal tints. These and the changing colours from the setting sun on the distant hills make pictures of indescribable loveliness and beauty.

For the angler there are running streams stocked with trout, with cascades frequently met along their course. There are also old mining races of fresh pure water winding round the hillsides. Besides fishing, there is shooting, rabbits, foxes, and parrots of varied colours being plentiful. The Gilmore Creek possesses good hydro-electric possibilities, and there has been a small town supply for some years. The far-famed Buddong Falls are only about 20 miles from Batlow for those who like bush travelling.

The average rainfall is about 50 inches, and water may be obtained almost anywhere by sinking from 6 to 60 feet.

Co-operation Amongst Dairy Farmers.

G. G. NEILL, Information Officer, Registry of Co-operative Societies.

BUTTER factory companies throughout the State are beginning to realise the advantages offered by the Co-operation, Community Settlement, and Credit Act, 1923. This Act was passed for the purpose of providing a simple and inexpensive method of enabling all sections of the community to form co-operative societies for the purpose of promoting their economic interests. Primary producers may form rural co-operative societies, and undertake the marketing of produce or the purchase of requirements on a co-operative basis. By this means farmers can secure a larger measure of control of the disposal of their products and reduce the cost of handling, and can also obtain supplies at more favourable prices.

In addition to furnishing means whereby new co-operative societies may be formed, the Act provides facilities for existing co-operative companies to transfer their registration from the Companies Act, 1899, and become co-operative societies under the Co-operation, Community Settlement, and Credit Act, 1923. A company which effects such a transfer secures the following advantages:—

(1) It has the right to use the word "co-operative" in its name.

(2) It is exempted from stamp duty on documents issued in connection with share capital.

(3) It is exempted from State income-tax on undistributed profits, and on profits distributed by way of bonus in respect of business done, when 90 per cent. of its business is done with its own members.

(4) It has power to include in its rules a provision to compel members to enter into an agreement to deliver all their produce to the society during a specified period fixed by the society, and to inflict fines upon a member for any breach of such agreement, thus assuring itself of the loyal support of its members. Such an agreement would be illegal and "in restraint of trade" if entered into by a company registered under the Companies Act, and is a special power conferred by the Co-operation, Community Settlement, and Credit Act, 1923, on societies registered under that Act. A company does not obtain such power automatically on transfer of registration, but if it desires to secure the power it must include such a provision in its rules.

(5) It is not required to pay fees for registration as a society, nor for any alteration of rules, nor for filing returns.

(6) In the event of a supplier leaving the district, or for other sufficient reason, the board, if it so desires, has power to refund his share capital within certain limits.

(7) It obtains increased facilities for transfer of shares on death of holder. Companies' shares can be transmitted only to an executor or administrator, but the Co-operation, Community Settlement, and Credit Act,

1923, provides that on the death of a member of a registered society the society may transfer his shares to any of the following persons:— (*a*) To any person who may have been nominated by the holder of the shares, or (*b*) if no such person has been nominated, to the executor or administrator of the deceased member, or (*c*) to any person that the nominee may specify, or if there is no nominee to any person that the executor or administrator may specify; notice specifying such person must be given to the society within three months after the death of the member.

(8) Its capital is not fixed at any particular amount, and can be increased if required without any legal formality, as the Act provides that the capital shall vary in accordance with the nominal value of the shares from time to time subscribed.

(9) Its members under 21 years of age may have all the privileges of an adult member, other than those of voting or holding any office in the society. An amendment to the Act which has been recommended by the Advisory Council provides that societies may, if desired, allow votes to members over sixteen years of age.

(10) It is provided with simple machinery for the settlement of any dispute which may arise between the society and a member, as such a dispute may be dealt with by an arbitrator or may be referred to the Registrar of Co-operative Societies for decision. This process of settling disputes is inexpensive and more expeditious than litigation.

(11) It may avail itself of the simple provision made by the Act for two or more co-operative societies of the same type to combine and form an association.

(12) Its affairs are subject to official inspection, the object of which is to protect the interests of the members in general.

(13) The general provisions for the control of societies registered under the Co-operation, Community Settlement, and Credit Act, 1923, are simpler than those for the control of companies registered under the Companies Act, as instead of operating under a memorandum and articles of association, model rules may be adopted which may be added to or varied at any time by passing a special resolution, so long as the addition or variation is not contrary to the provisions of the Act. A special resolution may be carried by a two-thirds majority of members present in person, or by proxy where the rules of a society allow proxies, at any general meeting of which notice specifying the intention to propose the resolution has been duly given according to the rules.

(14) There is provision in the Act for preserving rights attached to shares held at the time of transfer; for example, although the Act specifies that no member of a society may hold more than three votes, if the articles of a company provide for a greater number of votes, the shareholders may be allowed to retain those votes on transfer.

(15) The constitution under which a company operates if it transfers registration is much more elastic and adaptable to its varying needs than if it retains registration under the Companies Act.

Twenty-three of the existing butter factory companies have already registered as co-operative societies under the Act; in addition, ten have applied for registration, and registration is now being completed; and a further ten have indicated their intention of doing so, but have not yet taken steps to effect the transfer. The remaining factories have been granted temporary exemption from the provisions of the Act to enable them to consider the question of registration.

A provision which should be of considerable advantage to butter factories which register under the Act is that which enables any number of co-operative societies of the same type to form an association. By this means a group of butter factories may combine to protect their common interests, but each factory may retain complete control of its own internal affairs. The advantages of combined action can thus be secured without any danger of a small factory being absorbed by a larger organisation.

The Registrar of Co-operative Societies, whose address is 36 Young-street. Sydney, is the officer administering the Co-operation, Community Settlement, and Credit Act, 1923. He will be pleased at all times to furnish advice or information free to persons who are interested.

Coming Bureau Conferences.

The sixth annual conference of the Southern District branches of the Agricultural Bureau will take place at Young on 9th to 12th March, inclusive.

The conference of Central Coast branches, to be held at Windsor, has been postponed from 2nd and 3rd March until 18th and 19th May.

Distribution of the Parasite *Aphelinus mali*.

Since the efficacy of the parasite *Aphelinus mali* became apparent for the control of woolly aphis the insect has been widely established in the apple-growing districts of the State. Approximately 16,000 living parasites have been distributed to orchardists, with full instructions how to establish and spread them. In addition to 200 individual growers, the following have been supplied with batches :—

Fruit Growers' Association.—Batlow, Uralla, Sydney, Bathurst, Shipley (*via* Blackheath), and Yass.

Agricultural Bureau.—Penrose-Kareela, Kentucky, Copeland, Miranda (Sutherland), Mittagong, Aylmerton, Borenore, Lavington (Albury), Wallendbeen, Wingello, Bega, and Binalong.

Soldiers' Settlements.—Batlow, Lavington (Albury), Mittagong, Penrose, Wallendbeen, and Wingello.

Irrigation Areas.—Leeton, Mirrool, and Griffith.

Supplies of the parasite are not yet sufficient for colonies to be forwarded to all orchardists, and growers who have received specimens and established the parasites can assist by distributing twigs bearing parasitised aphis to adjacent orchardists.—W. B. Gurney, Government Entomologist.

Preserving Asparagus, Peas and Beetroot.

J. M. ARTHUR, Orchardist, Hawkesbury Agricultural College.

THE preserving of fruits while they are plentiful is becoming a common household practice and certainly one which should be encouraged. The economic value of the hobby is unquestionable, and many housewives take great pride in their work.

It is rather remarkable, however, that more is not done to stock the larder with those vegetables which are obtainable in a fresh state for only a few weeks in the year.

Vegetables are certainly more difficult to sterilise than most fruits, but if definite periods for processing are known little difficulty should be experienced. During the season 1924 rather extensive experiments were conducted at Hawkesbury Agricultural College in processing asparagus, peas and beetroot, a good deal of useful information being thereby obtained. The principal essentials for success are cleanliness, fresh vegetables, a suitable steam retort or open boiler for processing, and reliable rubbers and jars. For convenience the writer would recommend a "home canner," of which there are several types, purchasable for approximately £5, according to size and make. With this appliance temperatures much higher than boiling point (as in an open cooker) can be obtained, making it possible to sterilise vegetables in one cooking. If, however, one does not possess a retort, equal results can be obtained by longer and intermittent cooking in an open vessel. The following is a summary of ten tests in the preservation of the vegetables mentioned:—

Asparagus.

Twelve ounce jars were used, these being considered a convenient size for home purposes. The stalks were graded to uniform size, cut to lengths to fit the jars, washed thoroughly, the tough outer skin and scales scraped off, tied in convenient bundles, blanched by immersing the lower end in boiling water for two minutes, then the entire stalk for one minute longer, plunged into cold water for an instant only, drained, and packed carefully, tips upwards, into the jars. (The blanching process causes a shrinking and toughening of the vegetable and makes it more flexible, thus insuring a better and fuller pack.) The packed jars were filled with hot brine (4 oz. salt to 1 gallon of water), the tops screwed on (but not tightly), and the jars lowered into the boiling water up to the neck for five minutes to exhaust them. The lids were then securely fastened and the jars submerged for the cooking process.

The processing periods ranged from three cookings for fifteen minutes to three cookings for sixty minutes each. Although only two jars of the total went bad, the shorter periods are not recommended, a heavy cloudy sediment

developing at the bottom of the jars so treated. The longer cookings (those exceeding 2½ hours), on the other hand, appeared quite unnecessary. From the results obtained the following cooking periods can be recommended:—

In open bath, 212 deg. Fah.—(1) Three cookings each of forty-five minutes at intervals of six to twelve hours between; (2) one cooking of sixty minutes and two of thirty-five minutes intervals of six to twelve hours between.

In retort, at 10 lb. pressure.—One cooking for forty to fifty minutes, according to size of asparagus.

Peas.

Similar results to the foregoing were obtained in the processing of peas, those which were cooked for the short periods also developing a cloudy sediment. Following is the procedure recommended:—

Shell and blanch in boiling soda bath (1 oz. carbonate of soda to 4 gallons of water) for five minutes, then submerge in cold salt water (1 lb. to 4 gallons). Reject all broken peas, pack in jars within half an inch of the tops and fill with hot brine (2½ oz. salt and 2 oz. sugar to 1 gallon of water). Exhaust for five minutes and cook as follows:—

In open bath, 212 deg. Fah.—Three cookings of sixty minutes each at intervals of six to twelve hours.

In retort at 10 lb. pressure.—One cooking of forty to fifty minutes.

Beetroot.

Following is the formula recommended for beetroot:—

Wash and cut the stalks off to within an inch of the bulb and cook in the open bath for thirty minutes; grade to size, peel by rubbing with the hands, pack in jars and fill with hot water, exhaust for five minutes and cook.

In open bath, 212 deg. Fah.—One cooking of ninety minutes; if large beet, 120 minutes.

In retort with 10 lb. pressure.—One cooking of forty minutes.

In the test with beetroot, those that were treated under eighty minutes went quite black a few weeks after treatment.

Co-operation in Japan.

The co-operative movement in Japan dates from 1892, and according to *The Economist*, London, its progress has been remarkable. In 1900 a co-operative society law was passed which has greatly stimulated the movement. The law provides for four distinct kinds of co-operative societies, namely, (1) for supply of credit, (2) for sale of produce, (3) for purchase of supplies, and (4) for the common use of land, buildings, machinery, &c. There are now 14,259 societies, with a total membership of about two and three-quarter millions, and an aggregate capital of about £40,000,000. The co-operative movement in Japan is a rural movement. Over 77 per cent. of the members are agriculturists.

What Happens in Animals Infected with the Contagious Abortion Germ.

H. R SEDDON, D.V.Sc., Director of Veterinary Research.

THE contagious abortion germ, known scientifically as *Bacillus abortus*, has been found to be the common cause of infectious or contagious abortion in cattle—that is, of that type of abortion which is capable of being spread to other animals in a herd. Accidental abortions do occur, but they are by no means so common as is generally supposed, and where successive abortions occur in a herd they are almost certain to be due to contagious abortion.

Source of Infection.

The first point to consider is where the germ comes from. There is no evidence to suggest that it is capable of living for any great time outside the body of an animal. It occurs, of course, in the discharges from the womb following an act of abortion and should such discharge persist may be voided for a period of up to about forty days after abortion. The discharged foetus and foetal membranes contain the organism and are the most important source of infection, but contamination of the pasture from such material does not persist indefinitely. The causal microbe is relatively easily killed, and though it might persist for some weeks in a mass of dried exudate protected from the sterilising action of sunlight, all evidence points to *recent* contamination of pasture being by far the most dangerous. But the organism is voided by other animals than those which abort, and it is this fact which does not appear to be fully realised. Were this germ to cause abortion (or other manifestation of disease) in every animal it attacks, the control of the disease would be relatively easy. We find, however, that for every two animals that abort there is another infected which does not abort, (in some herds it has been found that only half the infected animals abort) *and these seemingly normal animals also spread the germ with their discharge.* Then again it is common knowledge that an infected cow may seemingly recover from the disease, *i.e.*, she may abort and then at subsequent pregnancies carry her calf to full term. Examination of such animals shows, however, that the great majority have not recovered, and that the germ is present in the discharges at least half the calvings following such abortion.

Thus we find the germ is voided by three classes of cows:

1. Cows which abort.
2. Cows which, though infected, do not abort.
3. Cows which have aborted and apparently recovered.

It is possible by means of a blood test to determine which animals are infected and liable to spread the disease, but in the absence of such information all animals in a badly-infected herd should be considered as possibly

spreading the germ with their womb discharges, and tests have shown that in such herds the majority of animals are spreading the germ at each calving. The greatest source of danger, therefore, is these unsuspected, seemingly-recovered or normal cattle.

But it is not only with the womb discharges that the germ is spread—90 per cent. of the cows which the germ attacks become affected in the udder as well as in the womb and the germ is present in their milk, and such cows may continue to eliminate the germ in the milk for years.

Again, it should be pointed out that where an infected cow produces a living calf (at full term of pregnancy) such a calf will have the organism in its bowels and will spread the germ with its excreta during the first week or two of its existence.

A common clinical observation is that the disease is traceable to the use of a certain bull, and it has been found that the germ is capable of infecting the genital organs (testicles, &c.) of bulls and being spread with the seminal fluid from them. Moreover, *such bulls may show no outward sign of disease.*

Summed up, therefore, we can say:

(1) That the causal germ is commonly spread by all infected animals.
(2) That though about half of such animals may show past or present evidence of the disease, the breeding records of the other half may show no suspicion of the disease.
(3) That the most dangerous period in cows is during and immediately following abortion or parturition, *i.e.,* as long as there is any discharge from the womb.
(4) That an infected bull is dangerous whenever used for service.
(5) That an infected cow in milk is a possible source of danger if the milk is partaken of by other stock.
(6) That calves born of infected mothers may be spreaders of infection through their excreta during the first week or two of life.

Thus the possible sources of infection are much more numerous than is generally recognised. They are so common, in fact, that it is probable that for every animal which contracts the disease from an aborted cow, there is another that contracts it from some unsuspected spreader of infection (*i.e.,* from some apparently normal but really dangerous animal), and that in infected herds there are at least twice as many animals infected as the owner believes there to be.

How Animals Become Infected.

The next point to consider is how animals become infected.

The commonest method of infection is probably that of ingestion—that is, the eating of fodder, either grass or preserved fodder such as hay, contaminated with infectious material freshly voided by an animal affected with the disease. The most dangerous materials are "slinks" (foeti), membranes or uterine discharges. Infection through the excreta of newly-born calves probably plays a part in some cases, but the chance of infection from milk is, in the writer's opinion, rather remote. Infection frequently

occurs during service by bulls which are themselves infected and voiding the germ in their seminal fluid, or from the practice of allowing a bull to serve a cow which has a discharge and then to serve a clean cow shortly afterwards. Other possible methods of infection are the entrance of contaminated straws, &c., into the vagina or of infectious material into the eye, mechanical transmission from cow to cow when taking temperatures, introduction of the organism through the teat canal through entrance of contaminated foreign matter or by the use of a teat syphon or milk fever outfit previously used on an infected animal and not sterilised.

Bulls are infected chiefly in two ways—(1) By eating fodder contaminated with the germ (*i.e.*, from discharges), and (2) by serving a cow which has recently aborted or has a discharge (containing the germ) from the vagina.

Location of the Germ in the Animal Body.

Assuming that the germ has gained entrance to a cow, the following questions arise: Where does the germ go? What part does it attack?

"No matter by what method the germs enter the cow's body they show a predilection for the pregnant womb and the udder," and certain glands closely associated with the udder and womb. These are the only parts of the body which they attack or invade. If the animal is not in calf at time of infection the germ does not then invade the womb, but will establish itself in the udder in 90 per cent. of cases. There it remains until such time as the cow becomes in calf, when germs will pass from the udder to the womb and invade the membranes surrounding the calf, and such reinfection of the womb from the udder takes place at subsequent pregnancies. *Thus the udder acts as a permanent reservoir of infection in 90 per cent. of animals.* This fact cannot be emphasised too strongly, for even though such an animal may have ceased to abort and may carry all subsequent calves to full term, she remains a "carrier" and is a constant source of danger to other stock. This is the state in 90 per cent. of animals which become infected. What happens in the other 10 per cent.? In these, for some reason at present unknown, the germ never establishes itself in the udder. It goes direct to the pregnant uterus, causes abortion, is spread with the discharges and then in a week or two disappears entirely from the animal. These are the only animals which, once infected, recover entirely from the disease. Whether they can become infected a second time is unknown.

While in the udder the germ causes no alteration in the appearance of the milk and produces no changes in the udder. It is impossible to tell by clinical or post-mortem examination, even with the aid of the microscope, whether a cow is infected in the udder or not. The only satisfactory test for its presence there is a special examination of the milk, involving the inoculation of laboratory animals.

Turning our attention to the bull, we find that the only parts attacked are the internal genital organs, and though recognisable changes are produced in these parts it frequently happens that it is impossible to detect them during life, owing to the parts attacked being inaccessible.

Though calves born of infected cows commonly contain the germ in their bowels at birth, it is speedily got rid of. The germ does not persist in them nor in similar animals intentionally inoculated. It is only when animals get to a breeding age (*i.e.*, only when the genital organs and udder are about to function) that they can become infected.

The Effect of Infection.

Having discussed the manner of entrance of the germ and its location in the body, we may turn to the question: What does it do?

Put briefly, it produces abortion in about 70 to 80 per cent. of the cows to which it gains entrance. The majority abort at the first pregnancy after infection; others may not abort until a later pregnancy, but the tendency is for infected animals to abort sooner or later.

In the bull the disease causes no recognisable changes in the breeding habits of the animal, and the fact of infection may easily escape notice.

" Careful investigation of breeding records shows that of cows which have aborted once, a certain percentage may abort a second time and a few even a third time, but very rarely again, and this in spite of the fact that once infected, the great majority of animals continue to harbour the organism." These subsequent abortions may be at the pregnancy following abortion, or there may be one or more normal (full term) pregnancies intervening. Thus the disease tends to wear itself out, as it were, a character it has in common with many epizootic and epidemic conditions. In one large herd upon which the writer was able to conduct investigations it was found that of about ninety animals, one aborted the first year, seven the second year, ten the third year, twenty-one the fourth year, fourteen the fifth year, nine the sixth year, one the seventh year, and four the eighth year. It is important to note that five of the abortions in the sixth year and the four abortions in the eighth year were in heifers which had during those years been admitted to the herd.

Thus it will be seen that there is gradually acquired in infected herds a tolerance of the germ. A true immunity with recovery from infection does not take place except in about 5 or 10 per cent. of animals, the great majority of animals remaining infected and by acting as carriers constituting a danger to newly-introduced young stock. It will be noted that the period taken for the acquisition of this state of tolerance is somewhat prolonged, extending over several seasons, and the tendency is for about 70 or 80 per cent. of the animals to become infected and for the majority of those that are infected to abort sooner or later. Aborted animals are nevertheless of value on account of the fact that they have had their abortion, and though they may possibly abort again should subsequently become tolerant. The disadvantages in connection therewith are that there is often difficulty in getting them in calf, as they present a temporary sterility, and that as they void infection at at least half their subsequent pregnancies they are a constant danger to clean young stock that may be imported into the herd.

Notes on Bunging Casks.

H. L. MANUEL, Viticultural Expert.

APPARENT neglect in the bunging of casks is very noticeable, particularly in many of the smaller wine cellars. In some cases it may be that the wine-makers lack knowledge of the dangers to which the wines are exposed by inefficient closing down of each.

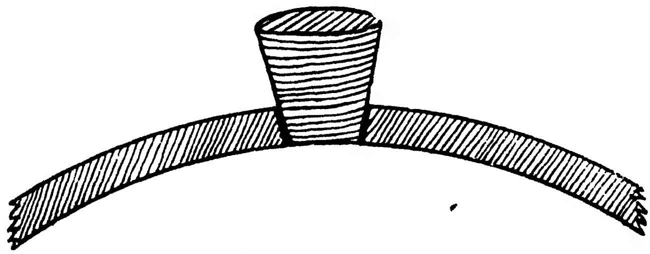


Fig. 1.—The Correct method of Bunging a Cask.

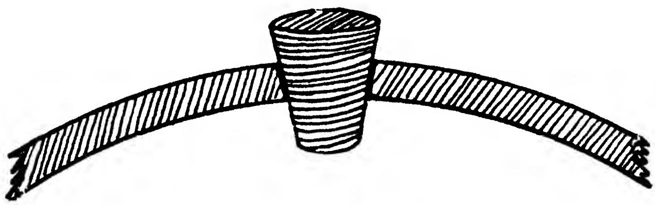


Fig. 2. The wrong method, the Bung protruding into the Cask.

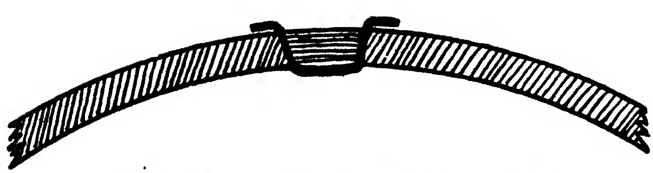


Fig. 3.—The use of the Shive is not recommended.

Light, dry wines of the hock, chablis, claret, and similar types require very careful handling, and should be kept as much as possible from exposure to air. It is known that evaporation takes place, causing the necessity for the casks to be periodically refilled. As evaporation goes on, the air space on top of the wine and below the bung increases, and wine-makers should endeavour to keep this at a minimum at all times. Badly-fitting bungs

increase evaporation, and are a source of trouble throughout the time they are in use.

A perfect bung is one made of non-absorbing hardwood, such as jarrah, and when inserted into the bung-hole of a cask it should fit so as to leave practically no air space when the cask is full of wine. The bottom of the bung, when driven in, should be on a level with the interior of the cask's bung stave, as in Figure 1. The bung in this case is well fitted, and is easily removed when the cask requires refilling.

A bung that protrudes into the wine, as in Fig. 2, is faulty. In using this type of bung a certain amount of capillary action takes place between cask and bung. Further, in the periodical refilling of the cask it is impossible to gauge exactly the quantity of wine required to fill the cask after allowing for the amount of bung protruding; either an air space will be left by the cask not being completely filled, or possibly it will be overfilled, and, on the insertion of the bung, a run-over will take place, necessitating the cleaning of the top of the cask.

The shive, as shown in Fig. 3, cannot be recommended for general cellar use under any circumstances. It is cumbersome to remove and to force it up the cask must be hit with a bung starter. The use of a bung starter causes a certain amount of disturbance in the lees, and this a cellarman should try to avoid.

Where shives are used in conjunction with hessian or rag, capillary action takes place, the rag or hessian simply acting like blotting paper in sucking up wine, which, on coming in contact with the air, causes a souring, and becomes a breeding-ground for acetic trouble. This class of bung is only used for transportation of wine, in which case its use, one may say, is only temporary.

Mottled Leaf in Citrus Trees.

Many orange and lemon trees growing in the very light sandy soils at Barooga, on the Murray River, show considerable "mottling." The soil appears to be almost pure sand, which, in the form of undulating hills, are the result of dust storms for many centuries. Trees up to twelve years old are growing here, and very many from the age of two years and upward are mottled.

Chemical fertilisers of all kinds appear to have been used with little, if any, benefit, but where applications of stable manuer in sufficient quantity have been made this unthrifty condition has been corrected. The necessity for annual green manure crops is therefore apparent, sufficient animal manure being unobtainable. A leguminous crop should be sown for preference, and the tick bean is excellent for this purpose. Sowing should take place about the end of February at the rate of 1 bushel per acre, with not less than 1 cwt. of superphosphate and ½ cwt. of dried blood.—R. J. Benton, Fruit Instructor.

Improperly Processed Honey.

W. A. GOODACRE, Senior Apiary Instructor.

As an examination of the hive reveals to the experienced man the errors made by beginners in the preparation of material and in manipulation, so, too, does the honey stored on the floor of a selling-house disclose improper processing and preparation by the apiarist. Indeed, by inspection at this stage it is possible to discover the measures necessary for improvement.

During the past season, which was a heavy one so far as production was concerned, a good deal of poorly-processed honey was placed on the market, just at a time, too, when the best treatment was required to induce sales, the market being glutted. Keen buyers pass the poorly-processed commodity, and it becomes a drug on the market. It should be borne in mind that nowadays there are very few buyers who are not keen judges; so it means that the time is gone when the careless or incompetent handling too common in the past will gain a measure of success. The fact is a great deal of such honey could have been made choice quality with a little extra care.

It is clear to us, firstly, that in many cases bee-farmers have not had sufficient tank accommodation for the thorough clarification of the honey during periods of heavy production; secondly, that a good deal of honey has been extracted before the ripening process had been sufficiently advanced by the bees; thirdly, sufficient care has not been taken in the tinning-up and preparation of the containers for market. In dealing with this matter it is clear that bee-farmers were not prepared for such a heavy surplus, and whilst the storage tanks were perhaps ample for an ordinary flow of honey, they were quite insufficient for a big harvest. As a result, instead of the honey being allowed about four days to clear, it had to be tinned-up probably within a day or two. The losses which occurred would have bought many extra tanks. The only case where honey may be tinned-up soon after extraction is when a heater is used, but it is only on rather large commercial farms that the heater is generally employed. Careful note of the prospects of the flora should be taken, and full preparation in the way of tank accommodation should be made, if the previous season's experience is not to be missed. Where honey has to be rushed through the tanks, it would pay before sending it to market to put it through a sure clarification during the slack period. It just means warming up the honey, pouring it into the tanks again, and allowing it to clarify properly.

Advice is often given about the risk of extracting honey before it is ripened by the bees, that is, before at least three-fourths of the combs are sealed, but we still find a number of men who take the risk. When the honey comes up against competition, as was the case this year, the honey drags on the market and is held over, which increases the risk of fermentation. To be prepared with sufficient surplus supers to put on the hives would allow

the bees to store their full quota of honey and at the same time allow the ripening process to be completed. It just means that the bee-farmers in fault were not prepared, or were foolish enough to take risks.

In the preparation of honey for market, the containers should be sound and bright, and cased before despatch. The buyer will surely pass " bumped-up " containers or those which have a poor appearance, and as the buyer tests from the top of the tin one containing a screw cap is the most convenient for him. Before despatch the apiarist could easily place himself in the position of a buyer and test each sample; it is the surest way.

We are coming to a point where an improperly processed and prepared article operates to the detriment of the whole industry. Before long this will bring about measures where honey of this class will be reprocessed and reprepared at the farmer's expense.

A Factor in Danish Success.

It is undoubted that the greatest factor in Danish success in dairying and marketing has been skilled leadership and guidance. The country has prospered not so much because the average rural worker has been reasonably well educated, but because he has been well led and advised by men whose scientific training was the best that could be given.—*New Zealand Journal of Agriculture.*

Kikuyu Grass in Queensland.

In the spring of 1923 roots of Kikuyu grass were forwarded to Mr. L. G. Alexander, Clump Point, via Townsville, for trial. Mr. Alexander now reports as follows:—

" The Kikuyu grass is doing extremely well in this district, and I have given roots to many interested farmers, who have planted them, with other grasses such as *Paspalum dilatatum,* in scrub soil with highly satisfactory results. Kikuyu stands the wet splendidly, and during the very dry time that we are now (December, 1925) experiencing, it is also one of the few grasses that are holding out and is maintaining its reputation as a drought resister. The area has not received any special treatment, the roots being merely put into the scrub soil with a hoe. Cattle, sheep, and horses are very fond of Kikuyu grass, and altogether the results have been very satisfactory."

In the North Coast districts of New South Wales all dairy-farmers who are growing Kiyuyu find that it is not only more drought-resistant than paspalum, but, in addition, will choke out the latter grass once its roots and runners are well established. Kikuyu grass is a good milk producer, and dairy cattle prefer it to paspalum or Rhodes grasses.—J. N. Whittet, Agrostologist.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat :—

Bena	Manager, Wagga Experiment Farm, Bomen.
Binya	Manager, Experiment Farm, Condobolin.
Canberra	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Condobolin
	Chaffey Bros., Nemingha.
	J. Watson, Merriwagga.
	E. J. Johnson, "Iona," Wongalia, via Parkes.
	T. R. Jones, "Birdwood," Forbes.
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
	W. W. Watson, "Woodbine," Tichborne.
	W. G. Law, "Wattle Park," Armatree.
	A. Millgate, Back Trundle Road, Parkes.
Clarendon	L. Jarvis, "Ferndale," Gilgandra.
	Manager, Experiment Farm, Glen Innes.
	E. J. Johnson, "Iona," Wongalia, via Parkes.
	A. Millgate, Back Trundle Road, Parkes.
Cleveland	W. Burns, "Goongirwarrie," Carcoar.
Currawa	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
	L. J. Death, Pinedale, Carrol.
Federation	Manager, Experiment Farm, Temora.
	Manager, Wagga Experiment Farm, Bomen.
	A. Millgate, Back Trundle Road, Parkes.
	H. J. Harvey, "Kindalin," Dubbo.
	W. W. Watson, "Woodbine," Tichborne.
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
	T. R. Jones, "Birdwood," Forbes.
Firbank	Manager, Experiment Farm, Condobolin.
	Manager, Wagga Experiment Farm, Bomen
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
Florence	Manager, Experiment Farm, Glen Innes
	H. J. Harvey, "Kindalin," Dubbo.
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
Genoa	Manager, Experiment Farm, Glen Innes
Gresley	Manager, Experiment Farm, Condobolin.
	W. W. Watson, "Woodbine," Tichborne.
	W. G. Law, "Wattle Park," Armatree.

Wheat (continued) :—	
Hard Federation	Manager, Wagga Experiment Farm, Bomen.
Major	Manager, Wagga Experiment Farm, Bomen.
Marshall's No. 3	Manager, Wagga Experiment Farm, Bomen.
	W. G. Law, "Wattle Park," Armatree.
Onas	E. J. Johnson, "Iona," Wongalia, via Parkes.
Wandilla	Manager, Experiment Farm, Temora.
	Manager, Wagga Experiment Farm, Bomen.
Waratah...	Manager, Wagga Experiment Farm, Bomen.
Yandilla King	Manager, Experiment Farm, Temora.
	Manager, Wagga Experiment Farm, Bomen.
	H. J. Harvey, "Kindalin," Dubbo.
	W. W. Watson, "Woodbine," Tichborne.
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
	A. Millgate, Back Trundle Road, Parkes.
	T. R. Jones, "Birdwood," Forbes.
Zealand	Manager, Wagga Experiment Farm, Bomen
Oats :—	
Algerian	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Glen Innes.
	C Bennett, Forbes-road, Cowra.
	J Lyne, Farm 1636, Yenda.
Belar	Manager, Experiment Farm, Temora.
Lachlan...	Manager, Experiment Farm, Temora.
Mulga	Manager, Experiment Farm, Condobolin.
	C. Bennett, Forbes-road, Cowra.
Myall	Manager, Experiment Farm, Temora.
Barley :—	
Pryor	Manager, Wagga Experiment Farm, Bomen.
Trabut	Manager, Wagga Experiment Farm, Bomen
Grasses :—	
Hooker's Fescue	Manager, Experiment Farm, Glen Innes.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

How Paint Saves Farm Buildings.

Farmers can save their farm buildings, brighten up their homes, and increase their credit and self-respect by using paint, points out a publication of the Tennessee College of Agriculture. Paint prevents decay by keeping out the moisture and air, while white lead, if it is used, poisons the wood fibre so that the fungus cannot live on it.

The Advantage of Farm Records.

By keeping records and using them as a guide to the management of his business, the farmer can stear clear of avoidable losses and add to his net income. Farm accounts kept by a group of Illinois farmers, says the American *Banker-Farmer*, led them to improve the organisation and operation of their farms in ways that added approximately 650 dollars to their average net incomes the seventh year.

Poultry Notes.

FEBRUARY.

JAMES HADLINGTON, Poultry Expert.

AT the time of writing the prospects in the poultry industry are not such as to attract many recruits. Nevertheless, poultry-farmers for the most part will carry on, mindful of the fact that it is not the first period of adversity through which they have passed, and those who do so will probably have no cause for regret. At any rate, previous experiences have all tended in that direction. That there will be a reduction in the number of poultry kept in the State is to be expected, and to that extent the industry will suffer, but any abandonment of farms where they can possibly be carried on would be suicidal. There are millions of money invested in the poultry industry by persons possessed of small means, or, at any rate, of the assets, and any scare that results in abandonment of farms will depreciate the value of all, and every farmer will be the poorer. These are the considerations that affect everyone in the industry. However, the worst is probably over. Already the prices of foodstuffs are coming down, and the price of eggs must, if only as a seasonal occurrence, go up. Unfortunately the ground that has been lost cannot be recovered, and poultry-farmers will have a struggle to face until July next. In the meantime, close attention to details on the farm may lead to a reduction of running expenses.

There are not many farms where savings cannot be effected by a close scrutiny of the stock, with a view to the elimination of unprofitable hens and useless male birds. From now on, whatever hens are to be disposed of on the score of age should not be kept after they have ceased laying. There is always a disposition to keep them longer, hoping against hope that they will come on to lay again, but this is a kind of "forlorn hope," and no risk should be taken under present conditions.

Grades of Eggs.

There are many ways by means of which the income of the farm can be lowered almost imperceptibly, chief among them in recent years being the grading of eggs. When only two grades of eggs were demanded, viz., hen and pullet, all above pullet size, or very small eggs, went as first grade, and were sold as such. Now we have three grades—some people would have a fourth. If the poultry-farmer is wise, he will stick to the three grades as they are now.

These grades put all eggs over 1¾ ounces into first grade, so long as the average is up to 2 ounces for the case. The minimum of 2 ounces is a different proposition: it would leave a large percentage of eggs to be sold as second grade with the same grade price attached to them. Let no poultry-farmer imagine that a minimum of 2 ounces, or 2¼ ounces as has been suggested in another State, will bring him a super-price. Nothing of the sort is likely. All that it means is a lowering of the average price to

the farmer for all his eggs, and the person who will benefit most is any dealer who is sufficiently unscrupulous to mix the first and second grades and sell them all as first. This, it is said, is done now. How much more opportunity offers if a minimum of 2 ounces is accepted by the farmer? In putting forward this opinion it should be understood that the writer is in no sympathy with the farmer who produces undersized eggs in large quantities, but all producers have some, and the question is how many more there will be if all below 2 ounces are regarded as such.

It might be argued that we cannot build up an export trade on less than a 2-ounce minimum. The reply to that is that we have already done so, and our eggs are said to be second to none imported into London. If we were having difficulty in disposing of our eggs overseas, then there might be some excuse for increase of the grade size. Our troubles are not of that kind. Finance and good handling are all we need to insure the absorption of our surplus of eggs. The 2-ounce egg is a very fine ideal, but the poultry-farmer cannot exist on ideals—he must stick to the practical. The prices received for eggs even now are below cost of production. Why then take on some idea that will increase the disproportion?

In this connection it is not generally recognised that while the earnings in nearly every other industry have nearly doubled since 1914, the earnings per hen on a 12-dozen basis, after deducting cost of feed, are round about the same figure as in that year and up to 1918. The earning over feed in 1914 was 8s. 4½d.; in 1923 it was 8s. 6d.; in 1924, 10s. 2d.; for 1925 it is not likely to exceed 8s. 6d. The years 1920-21-22 were abnormal, the returns being 12s. 9d., 13s. 4d., and 11s. 3d. respectively. It will be seen that to be comparable with the other industries the returns of the years 1920 to 1922 should be made now. Reviewing these facts, only one conclusion can be reached, and that is that but for the adoption of better methods in poultry-farming during the last decade, the industry must have become bankrupt during the past three years. It is difficult, therefore, to understand the advice that more shackles should be put on the industry by raising the grade standard, which, as already shown, means a reduction in the average price. It is useless to argue that a higher price will be obtained for a higher grade. If it did eventuate, it would in our opinion, be of a temporary nature only. First grade will be the highest price still, and all others will be lower. The poultry-farmer cannot risk having to give more weight for the same price—not at any rate under present conditions.

Selling Eggs by Weight.

Suggestions have been made from time to time that eggs should be sold by weight. Caution is here necessary, too. Weighing eggs out by grocers would mean a largely increased number of breakages in handling. Who would pay for this? Certainly not the grocer.

Keep Up the Size.

Notwithstanding all that has been said above, it does not follow that there should be any complacency on the part of the farmer with regard to the size of eggs produced. Slackness in this respect would mean coming

down to the level of the Asiatic egg. Only by striving to maintain and to improve the size of eggs can we command good prices in competition with other countries, or give value in our own. Not only so, but the maintenance of size is absolutely necessary to the maintenance of the proper physique and of those constitutional qualities necessary to high production.

Questions are asked from time to time as to the proportions of first, second and third grade eggs which might be regarded as normal production, especially in view of the fact that agents find difficulty in placing the lower grades—so much so that all kinds of suggestions have been made for dealing with them, such as pulping, drying, &c. This goes to show that too many small and medium eggs are being produced, but it is a difficult problem to pronounce upon. Many factors have to be taken into consideration, but in order to assist in the solution of this trouble an analysis of the egg returns for 1925 has been made at the Government Poultry Farm, Seven Hills. This shows that out of a total of 24,970 dozens of eggs there were 1,215 mediums and 544 pullets. The percentages work out at 4·88 and 2·17 respectively, and the distribution over the different months as under:—

1925.	1st Grade. doz.	2nd Grade. doz.	3rd Grade. doz.
January	1,680	166	94
February	1,401	161	46
March	1,104	137	3
April ..	729	60	
May ...	505	36	
June ..	1,327	31	
July ...	1,891	51	
August	3,153	108	
September	3,391	136	
October	2,943	91	
November	2,870	111	128
December	2,217	127	273
Totals	23,211	1,215	544

From this detailed distribution, it will be seen that (*a*) very few undersized eggs could have been produced by hens, (*b*) the medium eggs must have been produced by pullets just starting to lay, and (*c*) pullet eggs were only produced over the months when pullets are just starting to lay, viz., November, December, January and February. There were no pullet eggs to market between February and November, and only a small number of mediums. This, then, is what can be done by breeding strong stock, and there is no reason why every poultry farm should not show equally good results.

Complete figures are not available from Hawkesbury Agricultural College owing to the fact that many of the eggs laid there are used in the quarters, but there is no reason to suppose that they are less satisfactory. The proportion of small eggs laid by hens in the Egg-laying Competition is roughly 2 per cent. However, enough has been said to enable poultry-farmers to make a comparison with their own position in relation to small eggs

Where there is any serious falling off in size of eggs, no time should be lost in making efforts to raise the standard. To do this, new blood may have to be introduced. If so, the next couple of months is the best time

to secure it, early-hatched cockerels being obtainable. It should be remembered that where a flock has been so badly run down as to be laying a very large proportion of small eggs, the trouble will not be eradicated by one year's introduction of new blood. Nor should reliance be centred entirely on the introduction of new male birds. Good females are just as essential—that is to say, females strong in the traits required. Whatever, is attempted, therefore, by way of improvement in size of eggs should commence with the selection of hens the eggs from which are up to or a little above the desired standard. There is now just time to select such hens before they go into moult, and they should be marked to be used as breeders. In cases where the flock has been much inbred it may take two or three years to make any considerable impression. In fact, it is mostly better to start a new strain than attempt to mend up a flock that is badly run down.

British Trade in Frozen Eggs.

Following the discussion earlier in these "Notes," a report received by the Federal Department of Markets and Migration, Melbourne, is of interest. The Commercial Officer at Australia House, London, states that the intention of the Imperial Government to prohibit the importation of eggs preserved with boracic acid will undoubtedly create a big demand for liquid yolks preserved by freezing, and, in his opinion, the opportunity appears to be an excellent one for the shipment to England of eggs which do not meet the standard required for eggs in shell. It is understood that it is the practice to separate the yolk from the white, and to freeze the yolk, the albumen being dried and shipped separately.

A London firm which is said to be largely interested in the egg trade stated that when the regulations referred to become operative, the equivalent of the amount of preserved liquid yolk and dried albumen now imported from China will have to reach Britain either frozen or in shell. Of these two forms, this firm states, the frozen egg has many advantages for commercial use over those in shell, and as it is a commercial article that has to be replaced, it is, in the opinion of this firm, safe to assume that the demand in Great Britain for frozen eggs (not in shell) will increase enormously, with an obvious advance in prices. This firm gave the following reasons why previous efforts by Australia to establish this trade failed:—

(*a*) Lack of care in excluding musty or tainted eggs;
(*b*) Impurities such as straw and portions of shell in the eggs;
(*c*) Competition with China, which produced a highly superior article at competitive prices.

This firm (the name of which can be obtained on application to the Department of Markets and Migration), states that the present time is an opportune one for the establishment of this trade, and gives as one of their reasons that China, which now exercises practically a monopoly of the trade, is constantly in a state of revolution, with the consequent disorganisation of supplies. The firm offers its services to any Australian firm or association likely to be interested in this trade.

Orchard Notes.

FEBRUARY.

W. J. ALLEN and H. BROADFOOT.

Cultivation.

EVERY attention must be paid to cultural operations, and the land put into a good state of tilth. It is necessary for growers to exercise forethought, and, remembering that trees must make blossom buds for next year, do all that lies in their power to secure for the tree the most favourable conditions. Soil moisture should be conserved, the land kept free and open, weeds kept down, and in fact everything done conducive to blossom bud formation for the ensuing season.

Harvesting.

This is an extremely busy month for the apple and pear grower, as many of the commercial varieties of pome fruit will require picking. Growers are again reminded that care in picking and carting to the shed is of paramount importance. Much fruit is wasted by careless handling.

For the economical working of the orchard it is necessary that fruit be handled expeditiously as well as carefully—it is quite possible to combine speed and care. Pickers should be instructed in the correct method of picking fruit, and reminded of the importance of preserving the skin in a perfectly sound condition. In picking it is necessary to go over the trees several times, as all the fruit does not ripen simultaneously, and the more early ripening fruit will not hang on the tree until the least advanced fruit has matured. It is a great mistake to mix mature and immature fruit in the same case. The grower loses considerably in several ways. The mixture does not appeal to the buyer, and the immature fruit, had it been allowed to hang on for a longer period, would have improved in size, quality, and appearance. Grading, too, consumes more of the packer's time, and to the grower as well as any other business man " time is money." Prices obtained for small, immature, poorly-coloured fruit are almost invariably disappointing. Apples which are picked when immature and placed in cold storage are very susceptible to scald and to other physiological troubles.

Late varieties of canning peaches and drying peaches and late varieties of plums will be coming forward this month. Sultanas, Gordo Blanco grapes, and prunes will also be ready for drying. Fruit is not fit for drying until it is thoroughly ripe.

Apples for Export.

There are a few points, the observance of which is absolutely essential when fruit is intended for export. The grower should see to it that in his own interests he forwards none but varieties which are suitable for the

purpose. They should have been picked with the greatest possible care when properly matured, and if picked during the heat of the day should be allowed to cool before being packed. Only the best specimens should be forwarded, and they should first be graded for size and quality and then packed in clean, new cases, clearly marked in accordance with regulations. When packing see that the packers do not rush things—"raw haste," a distinguished writer tells us, "is half-sister to delay."

Each fruit should be properly wrapped and put properly into its place. The case should not be finished "slack." The apples should not be so loosely packed that they will rattle if the case is shaken, as this has a very detrimental effect upon the contents. Neither must the contents be packed high above the level of the case edge, or the fruit will be badly damaged when the cover is nailed down. Nailing down presses are very useful, and enable economical working, but they can be easily abused by anyone who does not realise the necessity of keeping the fruit in good condition. The machines are strong and capable of great pressure, and if they are employed to squeeze down lids on cases which have been packed too high they are used in a manner detrimental to the grower's interest. The nailer-down should be instructed to reject any case so packed that nailing down will prejudicially affect the contents. Wiring of cases is highly desirable.

So far as shipping and sales overseas are concerned, the orchardist has no control after he has despatched his consignment, and it is time growers awoke and moved in the direction of improving transport facilities, and securing responsible representation on "the other side," so that their interests might be more effectually protected. At present the grower is entirely at the mercy of the overseas dealers. Far too frequently do we hear of fruit arriving in an unsatisfactory condition, and prices which consequently do not cover cost of packing and conveyance overseas. A representative on the spot could investigate all such cases on the consignor's behalf; he could find out to what extent complaints were justified, investigate causes, and advise growers as to means of obviating defects, select markets, see that the fruit was advantageously placed before buyers, and in a general way could represent the growers of this State and watch their interests. The expense involved by having representatives in overseas markets could be reduced *pro rata* if the growers of the other States could be induced to co-operate.

Pests.

During the month the attention of the apple and the pear grower will be chiefly centred upon the harvesting of his crop, but attention must be paid at the same time to the control of codlin moth. All infested fruit should be picked up regularly and boiled or burnt This must be done whilst the fruit is actually infested. If the fruit is collected in bags or cases, and is allowed to remain until the grub has escaped, then the collection of the fruit is labour in vain. The work of destruction must be attended to promptly. There is an adage, it will be remembered, concerning the futility of locking the stable door after the horse has got out.

Budding.

Budding can be done during the month, provided the sap is flowing freely. The best results can only be secured by careful selection of budding wood from proved trees. Undesirable varieties can be worked over to a suitable variety. When young trees have been planted out and require a pollinator, no time should be lost in making adequate provision for cross-pollination.

Manuring.

If the soil is in good condition, this is a suitable time to apply artificial manure to citrus trees. It should be spread around the outward circumference of the tree. About the end of this month leguminous crops, suitable for green manuring, should be sown. In dry districts it is unwise to attempt green manuring except during a run of wet seasons, but there are many districts in this State in which green manuring may be profitably practised. Legumes enrich the soil in nitrogen. Ploughed in, they improve its humus content and its moisture-holding capacity, and make cultural work easier, assist in breaking up hard pan, render the soil less liable to erosion, and repair the effects of continuous cultivation.

Fumigation.

Fumigation, which is the only completely satisfactory way of dealing with scale pests of citrus trees, may be carried out this month, but under no circumstances should it be done if the trees are showing any signs of distress due to lack of moisture or adequate cultivation. The work should be done at night. When spraying is practised the work should be done on a cool day, and, as in the case of fumigation, the trees must be in good condition. A pamphlet on fumigation may be obtained free on application to the Department, and growers are advised to study this carefully and carry out to the letter the advice given therein.

Sowing of Subterranean Clover.

"Do not sow Subterranean clover in spring, as many did last season—the growing period is altogether too short, and results will be disappointing."

This should serve as a timely reminder to farmers interested in this adaptable and increasingly popular annual. Subterranean clover should be sown as early as possible in the autumn, and top-dressed later on with superphosphate, to give best results. Being an annual it must be allowed to form seed in November or December, otherwise it will be considerably thinned out of the pasture. Under ordinary conditions of stocking, however, runners of Subterranean clover set sufficient seed under the soil to maintain it in pasture for all time.

On areas where only 1 to 2 lb. of seed has been sown per acre, stock should be kept off Subterranean clover during its first year's growth; until the runners are well grown and seed has set. The intervening spaces between the plants are then quickly covered. If stock are put on before the runners are well established many plants will be pulled up and destroyed.—J. N. Whittet, Agrostologist.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society.	Secretary.		Date.
Guyra P. A. and H. Association	A. A. Brown	Feb.	16, 17
Pambula A. H. and P. Society	L. K. Longhurst	,,	17, 18
Wyong A. Association	L. C. Reeves	,,	19, 20
Central Cumberland A. & H. Association (Castle Hill)	H. A. Best	,,	19, 20
Southern New England P. and A. Association (Uralla)	D. G. Evans	,,	23, 24, 25
Newcastle A. H. and I. Association	E. J. Dann	,,	23 to 27
Tenterfield P. A. and M. Association	W. O'Shea	,,	23, 24, 25
Alstonville A Society	W. J. Dunnet	,,	24, 25
Gunning P. A. and I. Association	G. E. Ardill	,,	25, 26
Tingha	A. J. Dunshea	,,	26, 27
Blacktown A. Society	J. McMurtrie	,,	26, 27
Robertson A. and H. Society	J. F. Rofe	,,	26, 27
Tumut A. and P. Association	T. E. Wilkinson	Mar.	2, 3
Inverell P. and A. Society	W. Maidens	,,	2, 3, 4
Kentucky H. Society	W. J. C. Ward	,,	3
Bangalow A. and H. Association	....	,,	3, 4
Braidwood P. A. and H. Association	R. L. Irwin	,,	3, 4
Hunter River A. and H. Association (West Maitland)	M. A. Brown	,,	3, 4, 5, 6
Wauchope P. A. and H. Society	T. Suters	,,	4, 5
Oberon A. H. and P. Association	F. H Kelly	,,	4, 5
Taralga A. P. and H. Association	W. Jno. Jeffery	,,	4, 5
Adaminaby P. and A. Association	C. E. R. Pryce	,,	4, 5
Berrima A. H. and I. Society (Moss Vale)	W. Holt	,,	4, 5, 6
Nepean A. H. and I. Society (Penrith)	C. H. Fulton	,,	5, 6
Nimmitabel A. and P. Association	R. K. Draper	,,	9, 10
Coonabarabran P. A. and H. Association	C. D. Cox	,,	9, 10
Central New England P. and A Assoc. (Glen Innes)	G. A. Priest	,,	9, 10, 11
Mudgee A P. H. and I. Association	J. H. Shaw	,,	9, 10, 11
Yass P. and A. Association	E. A. Hickey	,,	10, 11
Ulmarra P. and A. Society	....	,,	10, 11
Cobargo A. P. and H. Society	T. Kennelly	,,	10, 11
Manning River A. and H. Association (Taree)	R. Plummer	,,	10, 11, 12
Cessnock A. Association	Bill Brown	,,	11, 12, 13
Crookwell A. P. and H. Society	P. R. Marks	,,	11, 12, 13
Campbelltown A. Society	W. N. Rudd	,,	12, 13
Batlow A. Society	C. S. Gregory	,,	16, 17
Blayney A. and P. Association	H. R. Woolley	,,	16, 17
Armidale and New England P. and A. Association	A H. McArthur	,,	16 to 19
Cumnock P. A. and H. Association	K. J. Abernethy	,,	17
Gundagai P. and A. Society	M. W. Holman	,,	17, 18
Macleay A. H. and I. Association (Kempsey)	N. W. Cameron	,,	17, 18, 19
Camden A. H. and I. Society	G. O. Sidman	,,	18, 19, 20
Rydal A. H and P. Society	V. Bruce Prior	,,	19, 20
Tamworth P. and A. Association	H. G. Read	,,	23, 24, 25
Cooma P and A. Association	C. J. Walmsley	,,	24, 25
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,,	24, 25, 26
Warringah Shire and Manly (Brookvale Park)	T. Murray	,,	27
Royal Agricultural Society	G. C. Somerville	,,	29 to Ap. 7
Gloucester A. H. and P. Association	H. Watson	April	14, 15
Orange A. and P. Association	G. L. Williams	,,	20, 21, 22
Upper Manning A. and H. Association (Wingham)	C. Stewart	,,	21, 22
Clarence P. and A. Society (Grafton)	L. C. Lawson	,,	21 to 24
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,,	22, 23, 24
Lower Clarence A. Society (Maclean)	T. B. Notley	,,	28, 29
Dungog A. and H. Association	W. H. Green	,,	28, 29, 30

[Later dates noted, but held over.]

VOL. XXXVII. PART 3. MARCH 1, 1926.

Agricultural Gazette of New South Wales.

Forage Poisoning in Animals.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research.

IN veterinary writings the term "forage poisoning" is now restricted to a peculiar kind of fodder or forage poisoning which ensues when the foodstuff responsible contains a poisonous substance or toxin produced by a particular microbe.

Thus the disease resembles the contagious diseases such as anthrax, tuberculosis, &c., in that it is microbic in origin, but with this important difference: that it is not necessary for the microbe to attack the animal directly—that is, to invade its body—it is in the feed, and there only, that the microbe does its deadly work.

This microbe, moreover, does not cause any disease in living plants, but only attacks them after death. In this it resembles the host of microbes to which decomposition or putrefaction are due, and, in fact, is usually found to grow and multiply along with them. It is not, however, speaking strictly, a microbe of decomposition, for it is not found in all decomposing material, and has of itself little decomposing ability.

Before it became known that the disease was due to this microbe, we find that it was referred to under various names, such as "sleepy staggers," cerebro-spinal meningitis, &c., both of which terms indicated that the disease was characterised by disorder of the brain and the act of locomotion. So varied are the manifestations of this disease that though the term "sleepy staggers" is an apt description of one form, yet there are other forms in which no such appearance is recognisable. It would seem therefore that the most suitable general term is "forage poisoning," though for other purposes one may refer to it by the scientific term of "botulism," which signifies that it is a disease caused by *Bacillus botulinus*.

Definition of Forage Poisoning.—Forage poisoning may be defined as a disease caused by eating foodstuffs which have become poisonous (toxic) through the growth in the fodder of a particular microbe, *Bacillus botulinus*. Horses are most commonly attacked, since it is that animal that is most commonly fed on prepared fodder, though cases in cattle are by no means uncommon, and even sheep and pigs may be affected at times.

It is important to realise that it is not infectious or contagious, and therefore that one animal does not contract it from another. In this it is like all other poisonings. It is only the animals which actually partake of the poison (poisoned foodstuff) that are affected. Certainly the majority of the horses in a stable are commonly affected at about the same time, but this is due simply to the fact that all these animals have received forage containing this particular poison.

Nature of Foodstuffs Involved.—One may say that any kind of fodder may at times be possessed of this poisonous property; thus the disease has been found to occur both in pasture-fed and in stabled animals, *i.e.*, it may

be contracted from grass pasture or from eating hay, chaff, grain, corn, or silage. It is found, however, that certain of these fodders are more liable than others to be dangerous, and to realise why this should be so we must briefly review what we know of the causal microbe, where it is found, how it may get into fodder and how it grows and produces its poison therein.

Where Bacillus botulinus is Found.—This microbe is what is known as a saprophyte; that is, may be found in soil, dust, or water, and ordinarily lives therein, gaining its nutriment from dead (decomposing) vegetable material. It is not capable of directly attacking either plants or animals in the living state. We have no exact knowledge as yet as to how common it is in the soils of the State, but such examinations have been made in other countries (and are being made here), and from these we have reason to believe that it is far from uncommon. This is supported by the fact that cases of the disease have been met with in the past three years in the Young, Warren, Coonamble, Gundagai, Murwillumbah, Inverell, Riverina, and Narrabri districts. It would appear, therefore, to be somewhat widely distributed If this is so it may be asked, why is the disease not more common? The answer is that the mere presence of the microbe itself is not sufficient; the conditions for its multiplication must also be present, and, as will be seen, such are quite special and not always available

How the Food comes to contain the Poison (Toxin).

Being in the soil, the microbe easily gains access to such fodders as hay, chaff and silage through the dust raised from the surface soil. It then requires suitable conditions of moisture and warmth in order to multiply, being in this manner much like a seed, which, as is well known, will not germinate and thrive unless conditions are adequate. This microbe is, of course, microscopic, and even when multiplying in fodder does not produce any recognisable changes: it of itself does not make the fodder appear in any way unwholesome. Conditions which favour its growth, however, also favour the growth of other micro-organisms, particularly moulds, and thus we frequently find it growing in mouldy fodder. This, however, is not entirely a chance arrangement, for whereas ordinarily this bacillus can grow only in the absence of air, it can grow in fodder exposed to air if it has a growth of mould overlying it. Thus mouldy fodders are more liable to contain this microbe and be dangerous. This association of the disease with the use of mouldy fodder was responsible for the idea held at one time that the disease was due to mouldy fodder. This is not so. Fodder which is simply mouldy can and does produce digestive substances, but it does not induce the disease we call forage poisoning unless this particular microbe has been growing in and has produced its characteristic poison in such fodder.

The degree of warmth necessary is furnished through the greater part of the year in a climate like that of New South Wales, where, even in winter, one finds the days sufficiently warm to allow of mould and bacterial growth.

In the summer, however, such is much more liable to occur, and we find therefore that the disease is met with chiefly in summer and autumn, particularly if the latter be mild.

The moisture requirement may be supplied by moisture in the fodder, but in such fodders as hay, grain, or chaff, which are normally somewhat dry, exposure to a shower of rain is especially favouring, and therefore it follows that rain during harvesting or rain on an open stack is liable not only to damage the fodder by inducing mould growth, but also to provide adequate conditions for the growth of the causal microbe of forage poisoning.

Thus it has come to be recognised that the disease is especially liable to be met with in seasons in which, during late spring, summer, or autumn, fodders have been exposed to heavy rains after a warm spell, and again followed by bright sunshine—in other words, humid conditions.

Silage is especially liable to be attacked, owing to two factors—(1) its high moisture content, and (2) its liability to become mouldy. As is well known, a well-prepared pit or silo of silage shows no mould through the greater part of the stack, but only on the surface, and it is just this mouldy surface layer which is liable to be dangerous. If silage be exposed, however, particularly if a pit be opened and exposed to the weather, the exposed part, previously sound, becomes mouldy, and if it has been contaminated by soil containing this microbe it is liable to contain the poison, and to be dangerous.

The point is that good, wholesome silage is not likely to be harmful. Damaged, mouldy ensilage may be dangerous, and should not be fed.

It may be wondered, seeing this is a disease associated with damage to dead plant material, how grass pasture can be dangerous. A moment's reflection, however, will serve to recall that whereas shortly-cropped grass would not be likely to be dangerous, tussocky grass, particularly the rank growths found near creek beds or on inundated land, may easily contain much dead material, both leaf and stalk, and such clumps may be somewhat damaged and mouldy about the butt.

In harvest fields, again, where winnowing is carried out in the paddock, the site of the winnowing operations is marked by the presence of a heap of vegetable material, usually containing more or less grain. Where rain has fallen on this we find it matted down and decomposed to a greater or lesser extent. The sprouted grain is readily sought by any animals which may be grazing in the paddock, and as they nose about in search of it, or even in search of whole grain, they are likely to gather some of this decomposing harvest refuse. Such material offers most suitable conditions for the multiplication of the poison-producing microbe, and there are several cases on record of the disease having been contracted under these circumstances.

There are two other facts concerning this poison that must be borne in mind, namely, that among poisons it is ranked as one of the most powerful, and that it is soluble in water. Regarding the first, it may be stated

that the poison has never yet been isolated free from extraneous matter. When produced in the laboratory by cultivation of the microbe in broth and subsequent filtration of the broth to remove all solid matter and the microbes themselves, we find such a fluid may be so poisonous that two drops may be sufficient to kill a horse. If the water were removed from such a quantity by evaporation we should have little more than a speck of dust, highly poisonous, but even then not the poison in the pure state.

Being soluble in water, it follows that the poison is easily washed from that part of the stack where it was produced to some other part, and thus we may find that fodder which appears quite sound itself, may, by having been overlaid with damaged fodder and subjected to rain, have had sufficient of the poison washed into it to cause the disease. A further point is that as the poison is so powerful, sufficient may be produced in small "pockets" of mould in the fodder, such pockets being so small and infrequent as to be easily overlooked.

It has further been recognised in some places that the disease may be contracted by animals drinking water that has percolated through decomposed and mouldy vegetation.

Moreover, it has been found in Australia that this disease occurs especially in those seasons when there are mouse plagues, when, of course, there are not only many living but also many dead mice in the stacks, and especially in the chaff therefrom. Such stacks have always a musty odour, and close examination will show that there, especially in the nests, are just the conditions suitable for the multiplication of this microbe, viz., moisture provided by the urine, and warmth from the bodies of the mice. The presence of dead mice, moreover, provides a most suitable breeding-ground for the growth of moulds and other micro-organisms associated with decomposition, a state of affairs which favours the multiplication of this poison-producing microbe, *if it be present.*

Toxic Fodders and Detection of the Causal Microbe therein.

It is not always possible to determine how the fodder has become harmful, and frequently it is impossible to detect the microbe in the suspected material. This is not to be wondered at, since we are looking for a microscopic structure, and the poison may have been produced only in certain small areas where both the microbe and the conditions favouring its growth have been together present. It is truly like the traditional "needle in a hay-stack." Further, the issue is complicated by the fact that in common with other bacterial poisons, but unlike such poisons as strychnine and arsenic, this poison produces its effects only after a definite interval of some days, usually three to seven. *Thus, it is not the feed the animal ate the day before it became ill, but that eaten a week before, that contained the poison.* It is this fact which usually makes it impossible to obtain for examination a sample of the truly poisonous fodder.

Where only portion of the fodder has been harmful it has usually all been eaten.

To exemplify some of the points dealt with in the preceding section, an account may be given of some of the fodders which have been held to be responsible for individual outbreaks:—

1. In this case the hay which was poisonous was that last harvested. This was from the lowest land, and was heavy in the butt on account of rank growth of moisture weeds.

2. Wheaten hay exposed to wet and then warm weather. Green and mouldy.

3. Wheaten pit silage. Mouldy, due to rain on open silo.

4. Oaten chaff, dark in colour and a little musty.

5. Wheaten chaff containing cracked corn. Slightly mouldy.

6. Maize silage. Top (mouldy portion) fed.

7. Vetches and oaten hay silage.

8. Hay from mouse-infested stack (several cases).

9. Sudan grass silage.

10. Oaten hay which had received a fall of rain in midsummer, while in the paddock. Top and side of sheaves discoloured.

11. Chaff from feed-room which had been used for some months without cleaning out. Roof leaky. Floor covered with several inches of old, musty chaff, the new supply being placed loose on the top. Disease occurred at time last loose chaff being used. (Probably some of the old, damaged chaff fed also, in mistake.)

12. Old straw stack pulled about by stock and much damaged by rain.

13. Stubble paddock contained an old heap of winnowings (partly decomposed) with grain sprouting therefrom. Evidence of animals grazing over this. (Three cases.)

14. Paddock rank grass grazed after heavy autumn rains. Large quantity of dead herbage from previous season.

15. Corn which, while in the crib, had been flooded. Very mouldy.

Other cases, in which the fodder appeared to be sound, included—(*a*) Use of paddock in a western district. Vegetation 80 per cent. saltbush, also "pig weed," Boggabri, *Chenopodium*, &c. Feed drying off slightly, and some of the herbage affected with a caterpillar web. (Impossible to state where poison produced.)

(*b*) Paddock containing quantity of Saucy Jack, "hog weed," trefoil, &c. (Source of poison not determined.)

(*c*) Grass paddock. Lot of mouldy fruit (used as pig feed) on the premises. (Did horses get access to this?)

(*d*) Oaten or wheaten hay, apparently sound. (Several instances.)

General Conclusions.

Consideration of the above brings out the following important points:—

1. That the foodstuff is usually mouldy but not invariably so.

2. That warm summer or autumn rains falling on the fodder and followed by warm weather are frequently responsible for the growth of the poison-producing microbe.

3. That though mouldy fodder is extremely common in such circumstances it does not necessarily follow that it is poisonous. It will be poisonous only if the particular microbe is *present and multiplying*.

4. That of the several foodstuffs those most prone to mould, *e.g.*, silage, should be carefully guarded from the conditions which favour mould growth. Mouldy silage should not be fed on account of this risk, though not all mouldy silage is poisonous.

5. That such damaged fodder should not overlie sound fodder, otherwise any poison (toxin) produced in the damaged fodder is liable to be washed by rain through to the sound.

6. While forage poisoning is widely distributed through the State and the mortality therefrom in each outbreak is high, yet, considering the extent to which damaged foodstuffs are fed, it must be only a small percentage that are poisonous. It is just this percentage that must be guarded against. Not having any means of determining which are and which are not poisonous, one should, as far as possible, see—

(*a*) that only sound fodder is fed;

(*b*) that where fodder is badly damaged such damaged portions are burnt;

(*c*) that, in order to minimise such loss of fodder, proper care is taken in the protection of stacks, &c., from (i) the effects of wet weather, and (ii) attacks by mice.

This is another of those diseases in which the old adage "prevention is better than cure" holds good. At the present time there is no method of treatment that can be relied upon for the successful treatment of affected animals. It is possible to immunise animals against the condition by means of an antitoxin, but such is very costly and the immunity of short duration, and, with the disease affecting such comparatively small numbers of animals and its uncertain occurrence, immunisation is not a practical measure for the control of the disease.

Variation in Colour of Seed Coat in Oats.

In Sunrise oats, and its selections, Mulga and Buddah, it is common to find a variety of colours in the samples coming from different districts. Sunrise is mostly white, and Mulga and Buddah creamy to pale brown, but darker, and even black seeds are often found here and there among the others. These, as has been pointed out before, are different from the wild oat, and need not cause much concern. We have this season found several instances, however, of a variation in colour of seed from the same plant, dark brown and pale brown seeds being borne on the stalks springing from a single seed. The variation in question does not affect the general appearance of the crop, the time of ripening, or the utility of the oat, but for pure seed production it is necessary to carry out systematic individual plant selection, a practice that, in fact, is desirable in connection with all oats, but especially so for Sunrise and its offshoots.—J. T. Pridham, H.D.A., Plant Breeder.

Lucerne Harvesting Methods at Gundagai.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

DURING the last few years a great increase has taken place in the area of lucerne grown on the Murrumbidgee River flats near Gundagai, and lucerne has proved such a profitable crop in the district that the next few years will probably see great developments.

Up to the present lucerne has been grown chiefly by graziers for use in times of drought. Two or three cuttings are made during the year, and the lucerne is pressed into handy-sized bales, usually 80 to 90 lb. each. These bales are of a very convenient size for stacking, carting out to stock, or forwarding by rail to western stations in time of drought. At present very little is sold on the Sydney market.

After two or three cuts are obtained, sheep and cattle are grazed on the lucerne for the remainder of the year. It is probable that in the near future this practice will be modified, and it will be found more profitable to discontinue grazing during the summer and to obtain four or five cuts per annum.

The growers are progressive, and are realising the tremendous advantages resulting from cultivating the stand after cutting and top-dressing with superphosphate in the early spring. It is in the matter of harvesting the crop, however, that the Gundagai lucerne growers are most up-to-date.

Cultivation Methods.

As so much has been written on the cultivation of lucerne in New South Wales, it is not intended to discuss this subject in detail; but it is thought advisable to give some idea of the local conditions and the methods adopted.

The soil is deep, rich alluvial loam, light to medium brown in colour, and varying in texture from a fairly stiff to a light sandy loam. It is well drained, and is periodically inundated by flood waters which usually deposit a layer of silt.

The land is generally sown with maize for a few years prior to growing lucerne. It is ploughed in June about 6 inches deep, then worked down fairly fine with the springtooth cultivator and roller, which are used alternately. Sowing takes place in August, 6½ to 10 lb. of seed being sown, and ½ to 1 cwt. of superphosphate per acre. The grass seed attachment of a wheat drill is used for sowing the seed, the tubes being allowed to hang free of the hoes, thus giving a broadcasting effect. A piece of wire-netting about 4 feet wide is drawn behind the drill to cover the seed.

The land is usually rolled before and after sowing on the light friable loams, but on the heavier soils, which are inclined to set very hard after rains, light harrows should be used after sowing in preference to the roller. On the heaviest soils, a different system is adopted. The surface, instead

of being rolled, is left slightly cloddy and the seed is then sown and lightly harrowed. The clods are found to prevent the surface setting hard after rain, and the germination is usually very satisfactory, provided the seed-bed is reasonably consolidated and is not too rough on top.

The Tumut River Flats from "Nargoon" Homestead.

A Side-delivery Mower at Work.
A fine crop of lucerne at "Warilya."

Autumn sowing on the alluvial country is not advisable, on account of the vigorous growth made by the variegated thistle. The thistle does not prove troublesome, however, on the upland soils, so for these situations autumn sowing is preferable, especially as those soils are inclined to dry out very quickly in the early summer.

Harvesting at "Warilya."

Messrs. S. Wilson and Company, of "Warilya" and "Tenandra Park" were practically the first to introduce the present system of handling lucerne to the Gundagai district. They use a tractor to drive the press and to move the plant when necessary. The usual routine is to cut the crop with an ordinary mower. Sometimes the side delivery mower is used, but the general opinion seems to favour the former.

The machine is started in the morning, and a few hours later the hay rake commences to rake the lucerne into windrows and then into cocks. If the weather is hot and dry, as it usually is in summer, pressing can be commenced the following afternoon, that is, twenty-eight to thirty hours after cutting. If the weather is only moderately hot a longer period must elapse before the hay is ready to press. Experience is necessary to decide

The Push Rake at Work.

when the hay is ready for pressing. The push rake is used to bring the hay to the stationary pressing plant, where it is pressed into bales of about 90 lb. and temporarily stacked.

Some growers merely rake into windrows and do not cock. The quality of the hay is, however, not so good in this case. The hay cures better and more leaf is retained when it is cocked soon after being raked into windrows.

Labour.

One man or boy is required to drive the push rake; one man then forks the hay on to the platform where another feeds it into the press. Two men are employed to wire the bales, and a third stacks them as they come from the press. In addition, another man is required to attend the engine and cut the wires for baling. No. 14 gauge galvanised wire is used. One coil is sufficient to cut 840 wires.

To work the plant nine men are required. This includes a driver for the mower and another for the dump rake. Mr. B. Wilson states that the biggest day at " Warilya " saw 465 bales pressed in eight and a half working hours, but the average would be about 350 to 400 bales a day.

Pressing Hay at "Warilya."

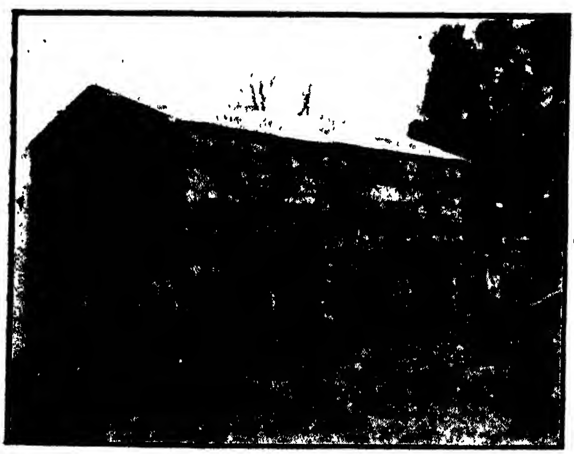
Feeding the Stationary Press.

With this plant, Mr. Wilson can handle about 90 acres of lucerne in a normal summer. By the time one cut is cleaned up and stacked away, the crop has grown sufficiently to commence cutting again. For economical handling the paddocks should not be larger than 30 acres, and smaller will be found even still more convenient.

Moving the Plant.

With the stationary system, it is necessary to shift the plant occasionally so as to avoid having to carry the hay too far on the push rake. In a normal crop, one move a day is all that would be required. Moving is by

Moveable Hay Press at work at "Nargoon."
Note the wires cut ready for use.



A Stack of 2,500 Bales at "Warilya."

no means a lengthy operation, taking on an average no longer than twelve to fifteen minutes. The belt is taken off and the tractor pulls the press to the next position, where the tractor is turned round and placed in line and the belt replaced.

The Bales.

The bales, after losing some weight in the stack, average about 84 lb. and are therefore easily handled. Being stacked as soon as they are pressed no colour is lost.

Two wires are placed on each bale. The bales made at "Warilya" are 16 inches x 18 inches and about 3 feet 4 inches long. They can be made longer or shorter as desired. A larger machine is on the market turning out bales 17 inches x 22 inches. In the United States of America a smaller machine is also made, the bales being 14 inches x 16 inches, but the medium size is most favoured in New South Wales.

The bales are carted to the hay shed and stacked by means of a hoisting device worked by one horse. Additional stacks are sometimes built in the open. These are either covered with sheets of iron or are built with a gable roof and thatched to keep them dry.

Live Stock.

At "Warilya" on 800 acres of alluvial soil at the present time, 3,400 sheep and 130 head of cattle are grazed. In addition two, and sometimes three, cuts of lucerne are pressed and stacked away.

The property is interesting from the point of view of fodder conservation, as in addition to the enormous quantity of hay stored there is also 1,000 tons of pit silage.

Methods adopted at "Nangus."

At Mr. J. McKinney's property, "Nangus," the manager, Mr. S. G. Shepherd, although formerly using the mobile method, has now discarded it for the stationary system, which he is convinced is much quicker and cheaper. Mr. Shepherd does not stack his bales as they come from the press: he stands them up on end allowing a small air space between each bale. The hay cures better in this way, but the great advantage is that each bale can be quickly turned upside down should it be necessary in wet weather. If rain occurs before the bales are carted, a few days are allowed to elapse to permit the tops to dry out thoroughly; then the bales are turned upside down to allow the bottoms to dry. This can be done much quicker with the bales stood up as described than if they were stacked. The system necessitates moving the press along a few yards so as to avoid having to carry the bales too far, but the change of position is effected in three or four minutes, consequently it is hardly worth considering.

Instead of a hoist pole, the bales are loaded by two men using long-handled hay forks with the prongs cut down to a little less than half their original length. The bale is laid flat on the ground and the two men push their short-pronged forks into the side of the bale, then holding one hand up close to the prong and the other near the end of the fork-handle, they hoist it straight up on to the waggon. This method of loading is infinitely quicker than any other known system, and it is not particularly heavy work for the two men loading. The same method is adopted for lifting the bales from the waggon to the stack.

Harvesting at "Nargoon."

Mr. J. O. Robertson, of "Nargoon," near Gundagai, does not use the stationary method. When the lucerne is ready to press, the pressing plant, drawn by two horses, is moved along between the windrows. The hay is forked directly into the press and the bales are left scattered over the paddock. This method, although requiring less men to work the plant, is much slower than the stationary system. The plant has to be frequently moved along, and as the bales are left scattered all over the field, considerable time is required to cart the bales to the stack. An average day's work with this plant in a medium crop would be 250 bales. Many lucerne growers, while using this system of pressing, are aware of the advantages of the stationary method, and in the near future a great number intend to adopt the latter.

Comparisons.

The stationary method, while employing only two additional men, is capable of turning out from 100 to 150 bales a day more than the mobile system, and the hay can be carted from the field in about one-fourth the time. It is difficult to get accurate figures as to the costs of each method, but the evidence offered leaves no doubt whatever that the stationary system is much the cheaper.

Quality of the Hay.

At present on the Sydney market there seems to be a prejudice against derrick-pressed hay. As far as quality and the amount of leaf is concerned, the derrick-pressed hay leaves nothing to be desired, provided (1) the side delivery rake is not used, and (2) the hay is cured in cocks, not in the swath or in windrows. Cocking is necessary to the production of first quality hay.

Dairymen and others like to be able to lift hay off in layers instead of having to burst a bale completely open; but if the instructions given above are followed, this can be done with derrick-pressed hay.

Return of Infectious Diseases Reported in January.

The following is the return of outbreaks of the more important infectious diseases reported during the month of January, 1926 :—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	Nil.
Piroplasmosis (tick fever)...	Nil.
Swine Fever...	Nil.
Blackleg	1

—Max Henry, Chief Veterinary Surgeon.

By an amendment (gazetted on 5th February) of the regulations under the Agricultural Seeds Act, 1921, seeds of red rice or paddy rice (*Oryza sativa*, var. *rufipogon*) are now classified with noxious weed seeds.

Bovine Tuberculosis Yields to Systematic Combat.

With more cattle being tested annually and less tuberculosis being found, the outlook for suppressing this disease is most favourable, according to a report just prepared by the United States Department of Agriculture. Following is a condensed statement of progress during the last eight years of the work that has been conducted co-operatively by State and Federal officials under a systematic plan:—

Fiscal Year.	Cattle Tested.	Per cent. of Reactors.
1918	134,143	4·9
1919	329,878	4·1
1920	700,670	4·1
1921	1,366,358	3·9
1922	2,384,236	3·5
1923	3,460,849	3·3
1924	5,312,364	3·2
1925	7,000,028	3·1

The decline in the percentage of reactors, though striking, does not necessarily mean that the disease is being eradicated at quite so rapid a rate—early in the work the testing was conducted more largely in herds suspected of being infected, while in recent years there has been more testing on a country-wide basis, in which all herds were tested, whether suspected or not. The figures presented however, are evidence of unmistakeable progress in reducing the extent of bovine tuberculosis in the United States.

How to Fertilise Fruit Trees.

There are those who entertain the idea that anything can be done any where but in Australia. Some people even think such things about the fertilising of fruit trees, but a short article in the *Pacific Rural Press,* published in California, U.S.A., shows that Californians are in identically the same position as growers in New South Wales.

A subscriber who has a twenty-year-old apricot orchard asks the *Press* how he should fertilise his trees, and the following sentences introduce the reply:—

"How we dread to see a question like that coming at us! It is one occasion in our young life when we have nothing to say. We don't know a blooming thing about it. Neither does anybody else for that matter, which leaves us in an awful fix. . . ."

And then this well informed American journal suggests that the inquirer should grow a leguminous cover crop in his orchard and also run "a few small plots," manured according to the suggestions of a "thoroughly reliable fertiliser company"!

Evidently they are in the same quandary over there as to this orchard-fertiliser business as are most other places.

Championship Field Wheat Competitions.

THE NORTH-WEST.

G. C. SPARKS, H.D.A., Manager, Glen Innes Experiment Farm.

FIVE crops only were eligible for championship honours in the North-west division. The details of the judging are presented in the accompanying table, the prize-winners being as follow:—

Messrs. Chaffey Bros., "Nemingha House," Tamworth (121 points) ...	1
Mr. J. Cavanagh, "Springhurst," Curlewis (119½ points)	2
Messrs. Rigby Bros., "Pine Hills," Pallamallawa (118 points)	3

Messrs. Chaffey Bros.' crop of Canberra was grown on a granite sandy loam, which has been under cultivation for many years. The land was ploughed in early March and again in mid-May, springtoothed late in May, and sown during the first week of June with 60 lb. of ungraded seed and 65 lb. of superphosphate per acre. The crop was fairly well grown and estimated to yield 22½ bushels per acre. Points were lost, however, on the score of purity, owing to the presence of strangers, a pronounced infestation with loose smut, and traces of flag smut and foot-rot

Mr. Cavanagh's crop (also of Canberra) gave the highest apparent yield of the series, namely, 25 bushels. It was grown on a chocolate light loam now cropped for the sixth time. The land was ploughed in January, springtoothed twice (February and March), sown early in May with 34 lb. seed (unmanured), and fed off lightly during the last week of June. Points were lost for impurity and through the presence of flag smut, loose smut, and a trace of bunt. This crop was also slightly weedy, carrying a little black oat, wild mustard, and prickly lettuce.

Messrs. Rigby Bros.' crop of Waratah was on light loam (belar country), now cropped for the fifth time. The paddock was fallowed in January, 1925, portion being ploughed and the residue disced. The whole area was springtoothed during the last week of March, and sown with a combine during the first week of May with 60 lb. of seed (unmanured). The crop was remarkably good for the seasonal conditions experienced, being estimated to yield 23 bushels per acre on an effective rainfall of 317 points. It was, however, very impure, and carried a little flag smut; it was nevertheless the only one of the competing crops to show a condition of weed freedom approaching championship form, the ubiquitous black oat and thistle being entirely absent, and the amount of other weed matter present almost inappreciable.

The Season.

Drought conditions prevailed throughout the north-west during 1925, the effective rainfall upon the competing crops being as follows:—Tamworth, 489 points; Curlewis, 356 points; Pallamallawa, 317 points; Narrabri, 235 points; figures for Inverell were unavailable. Naturally, the order in which

these figures occur corresponds with the order of the various crops in the schedule of awards. The best return per inch of effective rain was given by Pallamallawa with 7¼ bushels per inch, followed by Curlewis with 7 bushels per inch, and Narrabri with 6 bushels per inch. These figures are exceptionally good, and are indicative of the extraordinary capacity of the north-western soils. Pallamallawa had the advantage of a heavy rain storm in January, which caused a strong germination of weed seeds, the subsequent dry autumn permitting a complete eradication of this growth by spring-toothing, the benefit of which was shown in the notable cleanliness of Messrs. Rigby's crop. In most cases the crops got a reasonably good start due to the May rains (of 1½ to upwards of 2 inches), but the remainder of the year was extremely dry, September being practically rainless, and the crops—with the exception of that at Tamworth, which had the advantage of an August precipitation of 285 points—suffered severely.

Type and Purity.

The crops were again very faulty as regards type and purity, none being beyond criticism. It would appear to be absolutely necessary that north-western farmers should give more attention to their seed wheat, as it is upon this point that the greatest deficiency exists. Faulty type or a mixture of varieties will almost invariably result in depression of yield, yet improvement is comparatively easy to effect by the annual purchase of even small quantities of pure seed for growing on clean fallow and the gradual replacement of present types by pure strains of desirable variety. With the growing appreciation of the principles of good farming already apparent in the north-west, and with the development of the competitive spirit fostered by the field wheat competitions, it can, I feel sure, be confidently anticipated that within the next few years the crops of this territory will compare quite well with those of the other portions of the wheat belt in point of seed purity.

Disease.

None of the crops inspected were quite free of disease. Flag smut was present in every case, but nowhere was the attack severe. A trace of bunt was found in only one crop, but there was a little foot-rot and loose smut was fairly prevalent. The question of wheat disease control has been fully dealt with in many departmental publications, and it is sufficient to remark here that with the exception of loose smut none of the above-mentioned diseases offer insuperable difficulties in control. Flag smut and foot-rot will yield to cultural methods and bunt to seed treatment, but loose smut, although regarded as being of less consequence than the other fungoid diseases of wheat, offers certain difficulties which place it in a somewhat different position. There is a cumbersome hot-water treatment for loose smut which is not commonly recommended to farmers, the most practicable method of control being by the use of seed from clean crops only. This, of course, cannot be rigidly followed, but benefit will be derived from any efforts made in this direction.

With reference to the control of bunt, it is interesting to note that the seed of three of the competing crops had been treated with copper carbonate and the remainder with formalin, the common bluestone treatment not being in evidence. Except for one very slight trace, the crops were bunt-free, and while the three above-mentioned methods are equally effective, it seems inevitable that the use of copper carbonate will become general. The presence of bunt in a crop is indicative of carelessness, the disease yielding perfectly well to correctly applied seed treatment.

Varieties.

Six crops were included in the five entries for this competition, embracing four varieties of wheat. Canberra and Waratah each appeared twice and Clarendon and Cleveland once each. The position as regards wheat varieties for the various districts is now very clearly defined, and it is refreshing to note that the farmers are following so closely the lead given by the Department in that all four varieties referred to are departmental productions. Canberra, Clarendon, and Waratah are early-maturing sorts eminently suited for growing in the north-west, while Cleveland, being a late-maturing type, gives good results about Inverell, where it is quite widely grown. A judicious selection of varieties is one of the greatest factors in successful wheat culture, and while farmers are so alive to the latest developments the future can be regarded with equanimity.

Conclusions.

The winning crop—at Tamworth, where weather conditions were much less acute than elsewhere—was on land ploughed only three months prior to seeding, but of the other four crops, one was on winter fallow and the others on summer (January) fallow, and it is more than obvious that the relative excellence of these four latter crops grown under severe drought conditions was mainly due to the fact that they were on well-fallowed land, coupled, of course, with a wise choice of variety. As elsewhere in the wheat belt, successful wheat culture in the north-west depends very largely on fallow, and while it is possible—owing to the usually copious summer rainfall here—to conserve ample moisture by summer fallow, it would appear to be necessary to adopt in some measure a system of winter fallow for the purpose of weed and disease control. It is well known that it is difficult to secure a germination of the black oat, for example, except in winter, and therefore summer fallow cannot be expected to overcome this pest; also a long period of bare fallow is essential to combat certain fungoid diseases such as take-all, foot-rot, flag smut, &c., and therefore while short fallow is sufficient to produce good crops of wheat—probably heavier crops than would be produced by long fallow in the north-west—it would appear that an occasional long fallow will be necessary to maintain the productivity of the land. I am strongly in accord with the opinion of Mr. C. McCauley, Agricultural Instructor in the north-western district, that there should always be an area of long

fallow on every farm, even to the extent of bringing every paddock under long fallow once in three years. An adoption of this policy would mean that approximately two-thirds of the cropped area of each farm would be under crop each year, and that the crop would be seeded under the best possible conditions, which could not but result in a phenomenal increase of yield over the whole territory, and at the same time in the elimination to a very great extent of the now ever-present possibility of widespread crop failure.

The outstanding success of the five crops under review in a season when total failure was rife is indicative of the wonderful possibilities of the north-west. These crops were produced by methods within the ambit of every wheat-grower, and it only remains for growers generally to accept them to ensure the fulfilment of the wheat-growing promise of this section of the State.

DETAILS of Awards.

Competitor.	Variety.	Trueness to Type.	Freedom from Disease.	Evenness.	Condition.	Cleanliness.	Apparent Yield.	Total.
Maximum Points	...	20	30	20	10	*	†	
1. Chaffey Bros., "Nomingha House," Tamworth.	Canberra ...	17½	27	18	9	27	22½	121
2. J. Cavanagh, "Springhurst," Curlewis.	Canberra ...	16	27½	18	7	26	25	119½
3. Rigby Bros., "Pine Hills," Pallamallawa.	Waratah ...	15	28	16	9	27	23	118
4. Krauss and Truman, "Inverary," Nullamanna	Cleveland ...	15	28	16	9	22	23	113
5. R. J. McWilliam, "Matoppo," Turrawan, Narrabri.	Clarendon & Waratah.	17½	28	17	9	26	14	111½

* First crop, 24 points maximum; second crop, 25 points; third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points.
† One point for each bushel of estimated yield.

IMPORTANT IN DAIRYING ECONOMY.

PERHAPS first among the means of defeating waste in dairying is the conservation of fodder in the form of silage. Silage furnishes high quality succulent feed, which can be utilised at whatever season of the year it may be required. For winter feeding it is the cheapest and most efficient feed except for cows milking under forced test. For summer feed the Americans have proved that dairy cows will not yield any more from oats or millets than silage. This is hard to believe, but at Tilba we saw a herd go up 10 gallons a day on changing over from good chaffed green maize to ensiled maize.—R. J. BATE, junr., at Bega Agricultural Bureau Conference.

Field Experiments with Maize.

GRAFTON EXPERIMENT FARM.

Rate of Seeding Trials with Fitzroy, 1919-25, Summarised.

G. NICHOLSON, H.D.A., Experimentalist.

EXCEPT for the variety and the time of planting, this series of trials is identical with the rate of seeding trials with Leaming maize. A final report on the latter, outlining the aims and giving details of results, has already been published (see *Gazette,* November, 1925, p. 777), but the objects may again be briefly stated.

In deciding on the best rate of seeding to adopt, the farmer as a general rule has been influenced mainly by personal observation and by practices that have proved sound in other large maize-producing countries. That some definite data might be obtained the above experiment was laid down in 1919, the principal object being to ascertain over a period of years the most suitable rate of seeding for Fitzroy maize (or other similar late-maturing varieties) for the Clarence River district. It is not possible to lay down any hard and fast rule, for much will depend on seasonal conditions and the class of country the crop is grown on. When seasonal conditions are entirely favourable it may be expected that heavy seeding will result in an increased yield; under less favourable conditions lighter seeding will probably give the best results. A limit to the thickness of seeding will quickly be reached, for if the plant is to develop normally an ample supply of moisture and sunlight are essential; therefore overcrowding may tend to reduce the yield rather than increase it. When studying the results from the various rates it is advisable not merely to consider the yields, for there are other factors which may have considerable bearing on the actual net monetary return. Such factors are extra costs that may be incurred due to various treatments. For example, should heavy seeding be adopted the amount of seed for planting will be greater, also at harvest time the number of cobs to pull, husk and shell will be correspondingly greater than when only thin seeding is practised. All these items will tend to increase the cost of production per acre, and it is therefore necessary that all such costs be included when comparing the relative values of various rates of seeding, if a strictly comparable result is to be obtained. This procedure has been followed in compiling the results summarised in the appended table.

Past experience has proved that for tall-growing, vigorous varieties like Fitzroy ample space between the rows is necessary, to allow full development of the plant. In this experiment the rows were spaced 4½ feet apart.

The experiment consisted of five plots, each of five rows, and was laid down as follows:—

Plot 1.—Three grains every	40 inches in rows	(*check*),	average,	8·7 lb. per acre.
2 ,, ,,	32 ,,		,,	11·2 ,,
3 ,, ,,	28 ,,		,,	12·4 ,,
4 ,, ,,	20 ,,		,,	17·6 ,,
5 ,, ,,	40 ,,	(*check*),	,,	8·7 ,,

Planting was carried out each season about the middle of December with the maize dropper, on black alluvial soil which is fairly typical of the river flat country of the Clarence, cultivations before and after planting being uniform. No fertilisers were used. For notes on the seasons the reader is referred to the report of the Leaming experiments in the issue of the *Gazette* previously mentioned.

SUMMARY of Results.

Rate of seeding.	Average yield for five seasons.	Increased yield due to heavier seeding.	Value of increase.	Cost of increase.			Net gain.
				Through extra seed.	Through extra labour.	Total.	
inches.	bus. lb.	bus. lb.	£ s. d.	s. d.	s. d.	s. d.	£ s. d.
40	60 43	......	......	......	......	......	....
32	67 50	7 8	1 18 1	0 5¾	4 9¼	5 3	1 12 11
28	70 14	9 27	2 10 7	0 8½	6 3½	7 0	2 3 7
20	67 33	6 46	1 16 6	1 8½	8 7½	10 4	1 6 2

Conclusions.

The average results for the last five years show satisfactory increases in favour of heavier seeding. With one exception—that of 1921-22, when 20-inch seeding gave a slightly decreased yield—the more heavily seeded plots out-yielded the 40-inch spacing in all years. The value of the product was sufficient to cover all costs and show a reasonable margin of profit. It would appear that the maximum yield is reached with 28-inch seeding; thence the yield decreases owing to overcrowding. The cost of increase (harvesting, &c.) may be regarded as low, there being a tendency to speed up when the time is being recorded of the various operations; accurate recording is always a matter of some difficulty on such small plots. The variation in cost of harvesting plots in different years has been mainly influenced by (*a*) good or poor yield, (*b*) condition of the standing crop—stalks standing well or badly broken down, (*c*) freedom or otherwise of the land from obstructive weeds.

Experiments to test the rate of seeding for Leaming maize have given results in favour of 32 and 40 inch spacing. As already pointed out, the most profitable returns for Fitzroy maize were obtained from the heavier seeded plots, despite the fact that this variety is later in maturity and produces considerably more stalk and leaf growth than Leaming. When comparing the results obtained from the two varieties it is advisable to take into account the time of planting and also to what extent seasonal conditions affected the two crops. If this is done it will be found that in every season conditions were favourable to the later-sown crops, thus favouring

to a greater degree the heavier rates of seeding. Heavy seeding will result in a greater number of cobs being produced to the acre, but these are so reduced in size as to be only a little more than equal to a lesser number of cobs from lighter seeded areas. This is a point worthy of consideration if it is desired that the crop be used for the production of seed. It has been found that the percentage of seed cobs obtainable from the lighter rates of seeding is considerably in excess of the percentage obtainable from heavy seeding.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st December, 1925:—

Description.	Imports.	Exports.
Interstate.		
	Cases.	Cases.
Fresh Fruit ...	351,824	220,877
Tomatoes ...	66,113	...
		Bus.
Melons ...	25	26
	lb.	lb.
Canned Fruit ..	30,856	17,752
Dried Fruit—		
Unspecified ...	19,656	280
Currants ...	7,896	...
Raisins ..	10,444	56
Apricots ...	2,996	...
Apples ...	1,148	...
Prunes ...	2,604	...
Pears	168	...
Sultanas ...	168	...
Peaches ..	3,276	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruit—		Centals.	Centals.
Citrus	... .	689	35,104
Apples ..	... .	...	168
Pears	.. . .	...	76
Pineapples ...	.. . .	3	1,140
Bananas ...	.. . ...	607	26[illegible]
Other	... .	185	1,8[illegible]
Dried Fruit—			
Apples, Pears, Peaches, etc.	U.S.A.	lb. 10,753	lb. ...
Apples ...	....	..	400
Apricots ..	....	...	193
Currants .	....	...	93,189
Prunes ...	U.S.A.	76,108	782
Peaches ..	....	...	56
Raisins—			
Sultanas ..	U.S.A.	1,406	4,630
Lexias ...	......	. .	168
Other ..	United Kingdom	25	...
	Spain . .	45,693	1,860
	U.S.A.	25,270	...
Dates	Mesopotamia ..	1,[illegible] 289	..
	Iraq ...	3,147,[illegible]	64,962
Other .. .	United Kingdom	294	
	Iraq ..	3,632	...
	Asia Minor ...	72,194	...
	India	4,435	...
	China	10,675	2,984
	U.S.A.	76,626	...
	Spain	2,894	...
	Turkey	21,108	...
	Arabia	64	...
	Syria	6,864	...
Preserved in liquid—			
Apricots ...	....	...	181,461
Peaches ...	....	...	612,665
Pears ...	....	...	6,922
Pineapples ...	....	...	729
Other ...	....	..	27,553

Downy Mildew of Wheat.

Sclerospora macrospora, Sacc.

R. J. NOBLE, Ph.D., M.Sc., B.Sc. Agr., Principal Assistant Biologist.

During the past season a number of abnormal heads were observed on wheat plants in a few crops in the western and south-western portions of the wheat belt of this State. The condition was restricted for the most part to isolated plants, but one crop was observed to contain an area of approximately one-tenth of an acre in which 60 per cent. of the plants were affected. Frequently only a few abnormal heads were found on otherwise healthy individual plants, but other cases were observed in which all the heads were affected.

There were considerable variations in the symptoms of the disease on different plants, but practically all of the affected parts were characterised by a certain stiffness and fleshiness of the tissues. In some cases the diseased heads were larger and longer than normal heads, the rachis was elongated and somewhat thickened, and the individual spikelets were several times the length of the normal structures. The glumes and other accessory fruiting parts were considerably thicker than is the case in the normal plant (Fig. 1). In other cases the spikelets were almost entirely suppressed, and were represented only by small rudimentary structures (Fig. 3). In others, the tissues which should have developed into normal heads were transformed into a branched, curled, and twisted series of stalk and leaf-like outgrowths, in which all resemblance [illegible] entirely disappeared (Figs. 2 and [illegible]).

A number of plants were observed to have been severely stunted by the disease. These plants were often less than half the size of adjoining healthy plants, and were also characterised by the production of a number of small tiller shoots, which grew only a few inches and then died (Fig. 4). The leaves on affected plants also were somewhat fleshy in consistency, and the upper ones particularly had a tendency to remain upright instead of curling downward in the normal manner. The colour of the affected parts was usually a paler green than was the case in the healthy plant. No grain was produced in any of the diseased heads.

An examination of the leaves and heads of diseased plants revealed the presence of large numbers of oospores or resting spores of the fungus *Sclerospora macrospora*, Sacc. This fungus has long been known to occur in Europe. It has been recorded on wheat in Italy,[1] in France,[2] in the United States,[3] and recently in Western Australia.[4]

The same fungus or a very closely allied strain has been recorded on a number of other cereals and grasses, viz., maize, oats, barley, rice, and the

grasses of the genera *Bromus, Phalaris, Phragmites, Glyceria, Agropyron,* and *Lolium,* but the extent of its occurrence on Australian forms is not yet known.

There is as yet no complete record of the life-history of this fungus, although that of several closely allied forms has been established.

Fig. 1.—Heads of Federation Wheat.

(*a*) Affected with Downy Mildew; (*b*) Healthy.

It has been noted in previous records of this disease that its occurrence has always been in association with excessively moist conditions. The disease probably has been present in the State for some years, although definite evidence on this point is not available. It seems certain, however, that under Australian conditions also excessive moisture is necessary for the development of the disease. The heavy rains which were experienced

in most portions of the wheat belt in May and June of last year apparently provided conditions which favoured initial infections and subsequent development of the disease.

Heavy losses have been occasioned by the disease in Italy. Its history in the United States, however, indicates that it is restricted for the most part to moist sections of some of the south-eastern States, and it has not yet been recorded in those areas which are considered more satisfactory for wheat-growing.

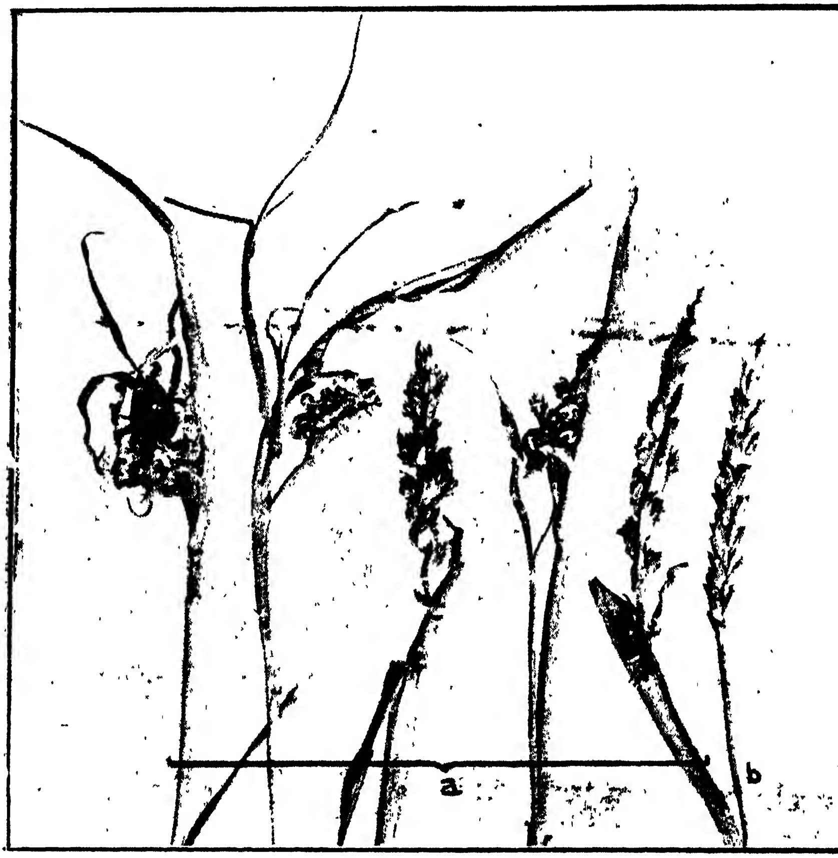


Fig. 2.—Heads of Turvey Wheat.
(*a*) Affected with Downy Mildew; (*b*) Healthy.

It is not yet known how long the disease will persist in an infested area under Australian conditions. It is most probable that the disease is carried over by means of the resting spores which remain in diseased leaves and straw in the soil, although some contamination might be expected in grain which is harvested from diseased areas.

The following measures which already are recommended for the control of some of our more important wheat diseases should also prove effective in minimising losses from this new source of trouble:—

1. Burn the stubble of crops which are known to have been diseased.
2. Do not use grain from such crops for seeding purposes.
3. Pickle all grain before sowing. The relative effectiveness of the present pickling dusts and solutions in the control of this disease, however, is not yet known.

Fig. 3.—Another Group of Heads of Turvey.

(*a*) Affected with Downy Mildew; (*b*) Healthy.

4. Do not sow wheat continuously on the same land. The introduction of at least one year's bare fallow should prove especially effective in the control scheme.

Although the Downy Mildew disease is the most striking in appearance of all the diseases which have yet been recorded on wheat in this country, its

history in other countries has indicated that special conditions of moisture are required for its development and propagation. These conditions are not likely to be of normal occurrence in our main wheat areas, and on this account it is not anticipated that the disease will ever be more than a minor factor in wheat production in this State. There are indications, however that the disease may cause serious damage under conditions such

Fig. 4.—Wheat Plant of Turvey Variety.
Severely affected with Downy Mildew.

as were experienced during the past season, and since there is a possibility of its causing damage in other cereal crops every effort should be made to stamp the disease out of those areas in which it is already known to occur.

LITERATURE CITED.

[1] Peglion, Vittorio.—"*La peronospora del frumento.*" Staz. Sper. Agr. Ital., Vol. 34, fasc. 5–6, pp. 506–532, 3 pl., 1901.

[2] Arnaud, G.—"*Sclerospora macrospora* on Wheat in France." Compo. Rend. des. Seances de l'Acad. d'Agric. de France. Vol. 1, No. 14, pp. 429–435, 2 figs., 1915. Abstracted in Int. Rev. Sci. Prac. Agric., Vol. 6, pp. 1407–1408, 1915.

[3] Weston, William H.—"The occurrence of Wheat Downy Mildew in the United States." U.S.D.A. Circ. 186., 6 pp., 1921.

[4] Carne, W. M.—"Downy Mildew (*Sclerospora macrospora*): An unusual disease of wheat." Jour. Agric. West. Australia, Vol. 1, 2nd ser., pp. 315–316, 1924.

Crop-growing Competitions, 1925.

SOME FURTHER REPORTS.

NARROMINE.

B. M. ARTHUR, H.D.A., Senior Agricultural Instructor.

OWING largely to the heavy rains which were recorded throughout the district in June, Narromine is one of the leading wheat granaries of the State this year. These falls, thoroughly soaking the subsoil, stuck to the crops right through a distinctly dry spring, and produced yields much above the district's general average. The 50-acre growing-crop competition closed with twenty-six entries, and was a decided success. Much interest was evinced by all competitors in the various points taken into consideration when judging, and many questions were asked by them as to how their methods might be improved. That these competitions are "bearing fruit" in improving the standard of farming was noticeable in the cases of three or four entrants who had competed in the 1924 competition. In these instances the seed sown was more true to type, and free from strangers; bunt had been effectively controlled where it was bad last year, and disease generally was not as prevalent.

Only twelve of the twenty-six crops submitted for inspection were grown on fallowed land, the balance being sown on stubble; but during June falls of rain aggregating from 7 to 10 inches were recorded, and this precipitation so soaked the soil that it was equivalent to the conservation of moisture achieved by fallowing, and although followed by a dry spring, was effective in producing crops as high yielding as those grown on fallow, though not as good in other respects, such as freedom from weeds and disease. The average estimated yields of all crops judged was 26 bushels. The high yields of crops on stubble land this season should be an object lesson to the lucky owners, who should realise that the yields were due to the abnormally heavy winter rains. As good or better results are obtainable, however, by artificial conservation of moisture by early ploughing of areas to be sown to wheat the following season, plus the judicious working of the ploughed areas when warranted, or what is commonly known as "fallowing." When fallowing is practised, the farmer is able to control his operations to a greater degree, and (with the necessary aid of sheep) control and eradicate weed growth and prepare a satisfactorily compacted seed-bed containing adequate supplies of moisture, which allows him to sow his seed when ready and to be independent of problematical rain, to sow varieties in the correct season, and above all to make the work lighter for himself and his animals, with the sure knowledge that he can at least look forward to some returns, whatever the future conditions may turn out to be.

The Season.

The past wheat-growing season was an extraordinary one, and proved beyond question that the wheat plant is extremely hardy, and will produce some grain if given half a chance. Many farmers did not hold out much hope for their crops at the end of September; yet without the benefit of rain of any consequence, the wheat ears filled surprisingly well and (at the time of writing) crops are all stripping much better than was ever anticipated. This was perhaps due largely to the frequency of cool nights, and a comparative absence of hot, strong winds. Good rains were experienced during the fallowing period of 1924 and summer months of 1925 until March, when a dry spell set in and the ground became so hard that farmers were not able to plough stubble areas, or in some cases to work fallows which had been set down hard by the heavy rains of the previous November. Good rains early in May allowed sowing to go ahead under favourable conditions, and ploughing to commence; but frequent rains of a heavy nature right through June and part of July prevented a number of farmers, who were late in their operations, from making much material progress; consequently the area under crop this season (72,997 acres) compares unfavourably with the 88,477 acres of 1924. All early-sown crops germinated well under the influence of the May rains, and were well developed by June, when heavy and continuous rains were experienced. Any late-sown areas had a tendency to become waterlogged, with consequent poor germination and spindly growth. The soil was thoroughly saturated in June and fair rains were recorded in July. From then on a dry spell set in and very little rain of any consequence fell, until most of the crops were too far advanced to receive any material benefit.

RAINFALL Table.

	Narromine P.O.	Strahorn Bros., "Waterloo"	W. Gainsford, "Yarran Farm."
	Fallowing period.		
	Points.	Points.	Points.
July, 1924, to April, 1925	1,848	2,045	......
	Growing period.		
May	245	197	110
June	728	721	1,000
July	174	146	9
August	80	91	26
September	76	......	......
October	100	55	67
	1,403	1,210	1,212

The Prize-winning Crops.

The winning crop (of Federation) was grown by Mr. Barry O'Neill, of Narromine, on very old land on a fallow ploughed with a disc in July, 1924, springtoothed in September, January, and again in April. It was

sown on 11th May, using 49 lb. of graded bluestone-treated seed without manure. The resultant crop was dense, of a nice even stripping height, well headed and filled, and it promised to yield exceptionally well. The type was fair, but points were lost for the presence of strangers and barley, also for traces of flag smut, take-all, and *Septoria* leaf blight. It was a very clean crop, marred only by the presence of a few wild oat, mustard and barley grass plants, and the whole crop was a credit to the grower, showing what can be ahieved under "better farming" methods. The second place was filled by Mr. J. H. Drew, Little Farm, Narromine, with a crop of Canberra grown on land which had been cropped nine times, including last year. The land was ploughed with a disc early in February and springtoothed three times during March and April before sowing on 1st May with a drill, using 45 lb. graded seed treated with copper carbonate. No manure was used. The crop lost points for the presence of odd strangers, diseases in the form of bunt, loose and flag smut, a few mustard plants, and a tendency for the grain to pinch and the crop to lodge.

The crop placed third was one of Hard Federation grown by a share-farmer, Mr. Dowton, on Narromine Station, the property of Mr. F. Mack. The stubble ground was ploughed during February and March, and the seed cultivated in at mid-May, using 45 lb. graded copper-carbonate-treated seed without manure. Points were lost for the presence of flag and loose smut, oats, mustard and other weeds, and unevenness of germination and stool, but the crop promised to yield close to eleven bags.

General Comments.

Of the twelve crops grown on fallowed land, three were on short or summer fallow. As previously mentioned, the season was a lucky one, producing crops on stubble land almost equal to those grown on fallowed areas, but such suitable conditions only occur once in a while, and the farmer who looks for them every year will find that he is "backing a losing horse." Fallowing and other practices which together constitute better farming methods are the only ones which will pay in the long run. Besides the extra conservation of moisture, fallowing helps to produce a more fertile soil (owing to the greater activity of soil bacteria), control weed growth, and also to free soils of fungoid disease, to say nothing of the better distribution of work for man and animals on the farm throughout the year.

The quantity of seed sown varied from 30 to 60 lb., with an average of 45 lb. The majority of the competitors had graded their seed also. If good graded seed, true to type and free from objectionable strangers, is obtained and then treated with dry copper carbonate (which does not in any way affect the germinating powers of the grain) this amount is perhaps sufficient, but the tendency of modern farming methods is to increase the amount of seed sown on fallowed areas, containing a good reserve of moisture, and to apply increased quantities of superphosphate

as a corollary to the production of dense, high yielding crops. While many of the competitors have undoubtedly realised the advantages of good pure seed, there is still room for considerable improvement in the purity of much of the seed sown. Strangers of a different period of maturity and height are objectionable in that they add to harvesting difficulties, and probable loss by shelling or the presence of green ears when stripping. These factors all tend to reduce the yields obtained, and a supply of pure seed, well graded, will amply repay the farmer for the extra trouble and cost involved. Graded seed, minus small grains, cracked and broken material, weed seeds, &c., will also tend to give a more even crop in density and height.

Only six out of the twenty-six crops were manured with superphosphate, the amounts varying from 26 to 50 lb. The majority of the competition crops were sown on stubble, and it is problematical whether it is wise to apply dressings of this invaluable aid to increased yields on stubble land, as one cannot be certain of the moisture content of the soil. It is very probable, however, that applications would have proved profitable this year owing to the heavy precipitations in June, and where land is fallowed and that extra reserve of moisture is known to be conserved, it is fairly safe to predict increased yields from the application of amounts of superphosphate from 45 lb. upward. Superphosphate is nowadays applied not so much with the idea of increasing soil fertility as with the object of forcing an early vigorous growth and creating a larger rooting system, which will consequently draw its supplies of plant-food from a greater area, creating a healthier plant which will stool well and be more resistant to disease. This increased early activity will result in earlier maturity, which is often a distinct advantage in the event of a dry spring.

No competition crop was totally free from the various fungoid diseases which affect the wheat plant, but a good percentage of the crops were only troubled to a slight extent with flag smut, loose smut, and foot-rot.

Flag smut (*Urocystis triciti*) is the worst enemy of the wheat plant in the Narromine district. Its presence in the crops is becoming better recognised by farmers, and many are taking steps to adopt the departmental recommendations for control. These are: treatment of the seed with a fungicide, the burning of stubbles to destroy diseased plants, the early and frequent working of the soil after rain to create conditions favourable to the pre-germination of the fungous spores (which, being parasites and having no host to attack, will be starved out), and finally, where the attack is a serious one, the rotation of an oat crop, which is not subject to this disease.

Loose smut (*Ustilago tritici*) was noticeable in many varieties, particularly Canberra. This disease cannot be controlled by seed treatment, as it is at the flowering stage that the plant is attached, and the disease is internal. Selecting seed from a crop not attacked by this disease is the best means of controlling it.

NARROMINE Crop Competition.

Crop Position.	Competitor.	Variety.	Age of land.	Fallow or Otherwise.	Seed Treatment.	Date sown.	Superphosphate (lb. per acre).	Seed (lb. per acre).	Trueness to type.	Freedom from Disease.	Evenness.	Condition.	Cleanliness.	Apparent Yield.	Total.
	Maximum Points ...	...	...	...	...	...	...	...	20	30	20	10	*	†	...
								pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts
1	Barry O'Neill, Narromine.	Federation ...	Old land	Fallow ...	Bluestone ...	11th May	None	49	18	27	18	9	26	34	132
2	J. H. Drew, Little Farm.	Canberra ...	9 crops ...	Short fallow.	Copper carbonate	1st May	None	45	18	24	19	7	28	33	129
3	Mack and Dowton, Narromine Station	Hard Federation.	3 crops ...	Stubble	Copper carbonate	Mid May	None	45	19	28	18	9	22	32	128
4	T. Tomlins, Wingfield	Marshall's No. 3.	2 crops ...	Stubble	Copper carbonate	Mid April	None	45	16	28	19	9	24	31	127
5	E. S. Binnie, Woodlands.	Canberra ...	Old land	Fallow ...	Copper carbonate	Mid May	45	45	19	26	18	9	22	31	125
5	Ken. Gainsford, Yarran Farm.	Waratah ...	Old land	Short fallow.	Formalin ...	Early May	50	36	19	27	17	8	25	29	125
7	W. Gainsford, Yarran Farm.	Improved Steinwedel.	Old land	Fallow ...	Formalin ...	Late May	50	45	20	26	18	8	28	24	124
8	A. G. Webb, Coringle	Turvey ...	13 crops	Fallow ...	A proprietary fungicide.	Early May	45	45	18	24	18	9	25	29	123
8	Mack and Conolly, Narromine Station	Hard Federation.	3 crops ...	Stubble	Copper carbonate	Mid May	None	45	18	27	18	9	23	28	123
10	T. Tomlins, Wingfield	Canberra ...	2 crops	Stubble	copper carbonate	Late April	None	45	17	27	19	8	24	26	121

* First crop, 24 points maximum; second crop, 25 points; third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops 30 points.

† One point for each bushel of estimated yield.

Foot-rot (*Helminthosporium sativum*) was found in several crops; also traces of take-all (*Ophiobolus graminis*). These two diseases are somewhat similar in their mode of attack, but foot-rot is usually found to attack isolated plants (commonly known as "white ears") while take-all is usually found in circular patches. Measures of control are similar to those recommended for flag smut except for seed treatment. For definite control it is also necessary to keep fallows free from barley grass and the *Stipa* grasses (spear or corkscrew), which are also subject to attack by these

Bunt or stinking smut (*Tilletia tritici*) was found in several crops, even where the seed had been treated with a fungicide, but mostly where one of the wet pickling methods, such as bluestone, formalin, &c., had been used. This disease is objectionable and detrimental to the quality of the grain, and it can undoubtedly be prevented by proper precautionary measures; therefore its presence can only be attributed to some carelessness on the part of the user in allowing reinfection through the escape from treatment of whole bunt balls, the use of infected bags or drills, or perhaps of a solution of insufficient strength. These fungicides are effective if due care is taken in their use, but they often affect the germinating power of the seed, whereas by using the dry copper carbonate dusting treatment there is no possible chance of re-infection, as action only takes places in the soil after sowing, when a solution is created with the aid of soil moisture; nor, as already stated, does the copper carbonate treatment injure the germinating power of the seed.

Stem rust or powdery mildew was not in evidence this season, but *Septoria* leaf blight was to be seen. This disease, by destroying the lower flag, would probably tend to prevent the grain from properly filling.

It is hoped that this report will be of some material use in indicating to competitors certain respects in which their crops failed and that their methods might be amended, not only with the idea of doing better in future crop competitions, but of bettering their conditions financially.

GRENFELL.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

The Grenfell district, situated in the heart of the central south-west, is one of the most favourably known in the State. It is eighty-six years since it was first pioneered, and it was twenty-seven years later that gold was discovered, the district yielding in four years over 1½ millions and boasting a population of 25,000. The decline of the gold-fields marked the rise of the agricultural industry, and Grenfell's zenith was reached in 1916, when 3,300,000 bushels of wheat were produced in the district. It was on Iandra and Bundah estates, long since cut up, that the share-farming system had its birth. The average annual rainfall for the last thirty-nine years was 24·20 inches. The rainfall is well distributed, and the district is undoubtedly one of the "safest" in the State. The area

under wheat has declined considerably in the last ten years, and last season. with 46,817 acres, was 9,000 acres behind the previous year. This was no doubt largely due to unfavourable weather at sowing time.

The Grenfell P.A.H. and I. Association is a live body, and this season conducted its third wheat-growing competition. The area of the competition is the Weddin Shire, or within 25 miles radius of Grenfell. The local competitions were judged in the R.A.S. championship for the central south-west in 1923 and 1925, securing first place in the first-mentioned year and second in the present season, being only 1½ points behind the winner.

The number of blocks judged this year was twenty-one, and although this was considerably less than the two previous years, owing largely to severities of the season, the entries were of much higher standard. This is indicated by the average yield of over 28 bushels per acre and the closeness of the awards, only 15 points separating the first seventeen competitors. In the accompanying table the points awarded thirteen out of the twenty-one competitors are given.

The Season.

The season was one of extremes, the prospects appearing excellent at times, only to be nullified by dry periods, prompting visions of crop failure. Late spring rains were responsible for the season turning out above the average. The fallow for the 1925 crop had good rain and was in excellent order up to harvest time, but 7½ inches in November and December destroyed the mulch, caused the soil to set firmly, and weed growth to make rapid headway. The average wheat-farmer cannot carry sufficient sheep to keep his fallows clean in times of excessive growth, and is loth to leave off harvesting to work his fallows. Consequently disc-cultivating implements have to be employed, the mulch is left much finer than it should be, and considerable moisture is lost. In January and February 2½ inches of rain fell, in March 139 points, and in April 30 points. A fall of nearly 3 inches in May did not eventuate until after the middle of the month, and a good deal of sowing in a dry seed-bed took place. That there was not sufficient moisture to germinate the grain in fallow which, commenced in August, had received nearly 23 inches of rain, is proof that a big improvement in fallowing methods is necessary. During the growth of the crop the rain was very patchy. In June, with 538 points, it was excessive, and the soil set firmly, causing partial suffocation of the root system and poor stooling. In July, 204 points were registered, and numerous frosts. Very little growth was made in the crops until September, and then it was only slow, owing to the low precipitation of 84 points for that month. The continued dry weather, accompanied by winds and a rise in temperature in October, caused considerable anxiety, but a fall of 127 points in the last two days of the month revived many crops which were fast wilting off, and saved the situation. A further fall early in November helped to fill the ear, and good yields of grain of excellent weight and colour were obtained.

Diseases.

Fungous diseases were not very prevalent this season. The most conspicuous were flag and loose smut. The former was present in most of the competitors' blocks, the highest amount of infection being approximately 10 per cent. The variety showing the greatest degree of immunity was Gresley.

Loose smut was again very prevalent this season, and is undoubtedly on the increase. It was present in sixteen of the twenty-one crops judged, the most susceptible varieties being Gresley, Canberra, and Turvey. Foot-rot and take-all were present in a few cases and to a slight extent only. Fourteen competitors treated their seed with dry copper carbonate for bunt prevention, and in these cases no trace of the disease was to be found. It was bad in two blocks treated with bluestone, no doubt carelessly. There seems little doubt that the dry method will entirely supplant other methods of bunt prevention.

The Winning Blocks.

The winning block was entered by Mr. O. G. Blayney, of Booroola, and was portion of a 220-acre crop of Waratah. It was sown with a combine in the third week of May with 60 lb. superphosphate and 52 lb. graded seed, treated with copper carbonate. The paddock had had ten previous crops, the last three on fallow. The fallow for the present crop was mouldboard ploughed 4½ inches deep early in August, scarified at the end of September, disced in the beginning of February, and sown with a combined drill and cultivator. The soil is a red basaltic loam of excellent quality. The rainfall on the fallow was 21 inches, and on the growing crop 12·58 points.

It was a very excellent crop, particularly free of weeds and undergrowth. For the season it was very dense and evenly headed. It was about 3 feet high, with the straw bright and clean. It was very disease-free, flag smut and foot-rot being present to only a slight extent. Most points were lost for the presence of "strangers," the crop otherwise being of good type and purity. The ears were particularly well filled.

The block with which Mr. W. R. Butler, Dellace, Grenfell, gained second place was an excellent one of Gresley, sown at the end of April with 60 lb. graded copper-carbonate-treated-seed and 60 lb. superphosphate. The paddock was first broken up twenty-one years ago, but had been fallowed for only the last two crops. The fallow was ploughed in July-August, spring-toothed twice before harvest, again in February and just prior to sowing. The crop was 3 feet 6 inches high, fairly dense, with bright clean straw and excellent ripening appearance. The chief defects were the presence of strangers and barley heads, variation in density, and a sprinkling of black oats. A slight evidence of tipped ear caused loss of points under the heading of "condition." A pleasing feature was the freedom from disease, for although loose smut and a trace of flag smut were apparent, they were present to only a slight extent.

The crop of Waratah with which Mr. G. H. Wilder, junior, of Greenethorpe, came third was sown on 19th to 21st May with 60 lb. dry-treated graded seed and 60 lb. high-grade superphosphate per acre. It was the seventh crop. The fallow was ploughed in mid July, "tined" in October, spring-toothed at the end of November, disced in February, and spring-toothed just prior to drilling. It was a very excellent crop, quite free of undergrowth, and only a few black oats were present. The presence of strangers caused loss of points. A little flag smut, but more foot-rot, were the only diseases present. Although for the most part dense, portion was badly stooled. It was 3 feet in height, well headed, with the straw clean and bright.

Comments.

An outstanding feature of the competition was the success of Waratah. This variety has been strongly advocated for the last three years. With the exception of Gresley in second place, it occupies the first seven places with an average yield of 30 bushels per acre.

The most successful varieties in the district this year have been Waratah. Gresley, Marshall's No. 3, and Penny. Strangely enough, the variety which has won the two previous competitions—College Purple Straw—was not entered by anyone this season.

A big improvement is noticeable in purity of seed, but there is room for still greater improvement. Pure-seed areas have been arranged with the members of several recently formed local branches of the Agricultural Bureau for next season's sowing, and they will be of considerable value in raising the standard throughout the district.

The blocks submitted were for the most part reasonably free of black oats and other weed growth, but several which were sown in a dry seed-bed suffered by the prevalence of the plant mentioned. Such sowing is a practice which is not recommended except where large areas have to be put in or mid-May is passed. Not only does this practice spell dirty crops, but from observations made in the last three seasons regarding the prevalence of flag smut it is very evident that sowing in a dry seed-bed is a contributing cause of the disease.

The prevalence of loose smut is a matter of some concern among wheat-growers in the district, particularly as the hot-water treatment recommended is not practicable for large areas. It does not seem to be generally enough known that infection with loose smut takes place during the flowering period. Seed from badly infected crops should on no account be kept for next season's sowing.

There is a tendency among local farmers to increase the quantity of seed per acre. It is of greater importance that the quantity of superphosphate per acre be increased another 15 to 20 lb. If properly graded seed—pure and true to type, not internally infected with disease, and carefully treated with copper carbonate for bunt—be employed, there is no necessity to make heavy sowings of seed.

If growers hope to escape the destructive influence of wheat diseases it will be necessary to sow fewer varieties and eliminate those susceptible. Furthermore, there can be no intelligent improvement of the varieties grown in a district until the majority of farmers concentrate on a few, and maintain or improve their quality by careful and systematic selection.

GRENFELL Crop Competition.

Crop Position.	Competitor.	Variety.	Type and purity.	Freedom from Disease.	Evenness.	Condition.	Cleanliness.	Yield.	Total.
	Maximum Points		20	30	20	10	*	†	
1	O. G. Blayney	Waratah ...	16	26	18	9	28	31	128
2	W. R. Butler	Gresley	16	28	17	7	27	29	124
3	G. H Wilder, junior ...	Waratah ...	17	24	16	8	28	30	123
4	H. O. McColl	do	17	25	18	9	22	30	121
	F. Adams	do	18	21	17	9	26	30	121
	R B. Black	do ...	17	24	16	9	25	30	121
7	O. G. Blayney, No. 1 ...	do ...	16	25	16	8	26	29	120
	C. Ballard	Yandilla King ...	20	25	14	8	26	27	120
9	T. R. Fanning	Marshall's No. 3	12	27	17	8	25	29	118
	C. Ballard	Penny	18	23	14	7	27	29	118
11	R. H. Thackeray, No. 1 ...	Yandilla King ...	15	22	18	7	25	30	117
	F. Adams	do	19	23	16	7	24	28	117
13	Hampton Bros.	Penny	19	22	14	6	27	28	116

* First crop, 24 points maximum; second crop, 25 points; third crop, 26 points, fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points.
† One point for each bushel of estimated yield.

GUNNEDAH.

C. McCAULEY, Agricultural Instructor.

NOTWITHSTANDING the abnormally dry season, the Gunnedah P. A. and H. Association decided to conduct a field wheat competition. Thirteen entries were received, and taking seasonal conditions into consideration the competitors deserve every credit for the excellence of their entries. The crops were all sown on either long or short fallowed land, and were remarkably well grown, but the incidence of hot, dry winds caused premature ripening in a number of crops, with a consequent prospect of the grain being pinched. The yields demonstrate what can be done in the driest season if up-to-date methods are employed, and that if farmers in the north-west would only fallow their land their crop failures would be few and far between. In a good season there may be very little difference between the crops on fallowed and unfallowed land, except that the fallowed crop will be cleaner and more free from disease. In a medium season fallowed land will yield medium to heavy crops, unfallowed land light to medium. In

a dry season fallowed land will yield a light to fair crop, and unfallowed land little or none. It is suggested that if a farmer has a certain area of wheat land he should every year have one-third out in long fallow, one-third sown on long fallow, and one-third sown on a well worked short fallow. Under this system one-third will be out in long fallow every year, thus enabling black oats, weeds, and fungous diseases to be kept in check. Farmers who have carried out this system for a number of years have not had a crop failure, and this season averaged from five to seven bags per acre.

The varieties used were Canberra (8), Hard Federation (3), Waratah (3), and Aussie, Wandilla, and Cumberland (each 1). As a whole, the seed was of fair to good quality and purity (though a few strangers were noticed), and a decided improvement on the impure, run-out seed used the previous season.

The amount of seed varied from 34 to 60 lb. per acre. It was mostly graded and treated with dry copper carbonate.

The crops were free of take-all, foot-rot, rust and bunt; but were all more or less infected with flag smut. Loose smut was in evidence in the Canberra.

GUNNEDAH Crop Competition.

Competitor.	Trueness to Type.	Freedom from Disease.	Evenness.	Condition.	Cleanliness.	Apparent Yield.	Total.
Maximum Points.	20	30	20	10	*	†	
J. Cavanagh, No. 2 ...	12	29	16	6	27	28	118
Wood Bros.	19	22	17	7	22	28	115
C. Hathway, No. 1 ...	18	25	16	4	26	26	115
W. and E. Richards ...	19	24	17	6	26	22	114
W. Manning	19	25	16	7	21	25	113
Cope and Phillips ...	17	27	17	6	20	26	113
W. Grosser, No. 1 ...	19	28	16	4	26	19	112
J. L Muir	19	21	16	4	26	22	108
J. Cavanagh, No. 1 ...	14	29	10	6	18	25	102

* First crop, 24 points maximum; second crop, 25 points; third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points.
† One point for each bushel of estimated yield.

The Winning Crops.

J. Cavanagh, No. 2 (Canberra).—Soil, gritty to black. Previous crop wheat, 1924. Rainfall during growing period, 356 points; after ploughing, 860 points. The stubble was burnt off and the land ploughed during January, 1925; it was cultivated twice and sheep were run continuously on the fallow. Graded seed, treated with dry copper carbonate, was sown late in May at the rate of 34 lb. per acre without manure. Germination was good and the crop was dense and well headed, though a number of heads were

drought-tipped and some thin, uneven patches were noticed. It contained a number of strangers, a little flag smut, and a trace (very slight) of bunt. It was clean except for a few thistles and weeds growing on headlands. The crop was fed off. There was evidence that the grain would be slightly pinched.

Wood Bros. (Hard Federation).—Soil, chocolate loam. Previous crop wheat, 1923. Rainfall during growing period, 493 pts.; after ploughing, 2,049 pts. The stubble was burnt and the land ploughed during September and October, 1924, disc-cultivated in December and May, and harrowed in April. Graded seed treated with dry copper carbonate was sown on 6th and 7th May at the rate of 38 lb. per acre. The crop was dense and even, but contained tipped heads and a few wilted patches, in which the grain promised to be pinched. It also contained black sets, a little wild mustard, and some flag smut. The seed was pure except for a few strangers. The crop was not fed off.

C. Hathway, No. 1 (Hard Federation).—Soil, chocolate loam. Previous crop wheat, 1923. Rainfall during growing period, 359 points; after ploughing, 2,271 points. The stubble was ploughed in during July and August, 1924, and the land disc-cultivated on 20th December. Sheep were run continuously on the fallow. Graded seed treated with dry copper carbonate was sown on 20th to 23rd December at the rate of 38 lb. per acre. The result was a short, well-headed even crop, though a few heads were slightly tipped, and some thin, uneven patches were noticed; the grain was plump. The crop also contained some black oat patches, a fair amount of wild mustard, and flag smut. The seed was pure except for a few strangers. The crop was fed off.

Arsenic Pentoxide as a Poison for Prickly Pear.

Arsenic pentoxide is distributed in a powder form by the Prickly Pear Land Commission of Queensland and has been found to be most efficacious and the cheapest form of poison for the destruction of prickly pear. The Department has not carried out any tests with arsenic pentoxide in the powder form, but tests which have been made by the Queensland Prickly Pear Commission indicate that it is cheaper and more convenient than any other form provided it can be applied by an injection. It has the advantages that when once introduced into the pear plant it circulates both to the extreme segments and to the extremities of the roots, and then completely destroys the plant. Unlike arsenic, it is soluble in water. It is not dangerous to handle, is economical in use, and may be supplied to landholders in a concentrated powder form.

Experiments have shown that the poison is so powerful that one-twelfth of an ounce will destroy pear plants weighing 1 cwt. The poison does not entail danger to stock. The powder, before being used, is mixed in three to four times its weight of water. The present price is about 6d. per pound.—A. H. E. McDonald, Superintendent of Agriculture.

Farmers' Experiment Plots.

WINTER GREEN FODDER EXPERIMENTS, 1925.

SOUTH COAST.

R. N. MAKIN, Senior Agricultural Instructor.

THE following farmers co-operated with the Department in trials during the winter of 1925 with varieties of wheat, oats and barley to determine their value for feeding in a succulent state to stock:—

J. W. Childs, Camden.
C. T. Hindmarsh, Gerringong.
L. C. Owen, Alpine.
L. B. Garrad, Milton.
L. Evans, Dapto.

The season was not conducive to heavy yields. The weather at sowing time was unusually dry; so much so that planting was deferred until what is considered too late for the production of early feed, hence the crops were later than usual in running to seed head. Exceptionally heavy rain fell at the end of May, causing floods and seriously washing cultivated land in some cases. Falls continued throughout the month of June and then another dry spell set in. The wet spell, no doubt, accounted for the prevalence of rust, especially among the plots of Myall, Mulga and Lachlan oats—in fact, all varieties exhibited the trouble more or less, and it was a factor in the reduced yield in several cases, especially at Gerringong.

Many farmers who have been growing Mulga of recent years were a little disappointed with the results on this occasion, but it is a mistake to condemn this excellent variety on the returns under such conditions. There appears to be a lot to learn as to the full value of Mulga and Myall to the dairy-farmer in particular, for stock feeding. Their rapid growth as compared with that of other varieties is a well-known feature, but their value for grazing off has not yet been fully demonstrated. One paddock of about 5 acres of Mulga was noticed at Camden which had been grazed again and again through the winter, and the owner of the property speaks enthusiastically of the variety as compared with others of which he has had experience.

Some very fine crops of Sunrise were to be seen in different districts, that on the plots at Camden being one of the best. This variety is very popular, and though not as early as Myall or Mulga it should find room where early green winter feed is required. Lachlan was on trial on the South Coast plots for the first time and, as was conjectured, did not show up as a green fodder variety compared with others. Farmers were not impressed with its appearance, and, in view of the number of varieties which have proved suitable for early fodder under test, further trials with Lachlan scarcely seem necessary. Guyra still keeps up its reputation as a good midseason variety, and will probably yet prove a suitable variety for grazing when varieties are being tested out under such conditions.

The wheat varieties all grew up to their reputations, and are undoubtedly suitable for coastal conditions. The three varieties may be sown on the same date, as they will give a succession of fodder, owing to the difference in their periods of maturity. Trabut barley still maintains its reputation, but unfortunately seed supplies are limited.

These plots were in each case sown broadcast, both seed and manure, the latter (superphosphate) at the rate of 2 cwt. per acre. No returns are given of the plots sown at Milton or Dapto. Owing to the late sowing and the bad weather conditions experienced, both were fed off by stock.

YIELDS of Wheat, Oat, and Barley varieties for green fodder.

	Camden.		Gerringong.		Alpine.	
Sown	28th April		18th April		17th March	
Rainfall ...	1,886 pts.		3,366 pts.		Not available.	
	Yield per acre.	Date Harvested.	Yield per acre.	Date Harvested.	Yield per acre.	Date Harvested.
Wheat—	t. c. q. lb.		t. c. q. lb.		t. c. q. lb.	
Florence ...	12 17 3 20	25 Sept.	....	......	3 2 2 8	2 July.
Firbank ...	13 0 0 0	26 ,,	6 11 1 20	29 Aug.	3 15 0 0	30 ,,
Gresley ...	13 11 1 20	26 ,,	4 8 2 8	21 Sept	5 7 1 0	12 Aug.
Oats—						
Algerian ...	12 17 0 17	19 Oct.	9 17 0 16	5 Oct	....	......
Myall ...	13 12 0 16	3 ,,	6 5 2 24	5 ,,	5 2 0 0	28 Aug.
Mulga ...	15 17 0 16	3 ,,	6 2 3 12	5 ,,	5 4 2 0	20 ,,
Sunrise ...	17 5 2 24	5 ,,	7 2 3 12	5 ,,	....	......
Guyra ...	14 0 0 0	12 ,,	....	......	4 8 3 0	1 Sept.
Lachlan ...	13 2 3 12	12 ,,	5 5 2 24	5 Oct.	4 7 1 0	21 Aug.
Barley—						
Trabut ...	15 8 2 8	9 ,,	....	......	....	......

LOWER NORTH COAST.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

THE following conducted trials with winter fodders during the year:—

H. Wheeldon, Gladstone, Macleay River.
G. C. Lindsay, Huntingdon, Hastings River.
A. R. Longworth, Jones Island, Manning River.
B. Allen, Oxley Island, Manning River.
B. Richardson, Dumaresq Island, Manning River.
G. Levick, Taree Estate, Manning River.
A. C. McLeod, Tinonee, Manning River.
R. Richardson, Mondrook, Manning River.
A. H Norris, Mt. George, Manning River.
P. Barry, Markwell, Myall River.
Alex. Smith, Bandon Grove, Chichester River.
S Ebbeck, Vacy, Paterson River.
M. Smith, Paterson, Paterson River.
G. Crew, Gresford, Allan River.

Other plots were arranged for, some being sown, but owing to various circumstances no yields were available.

The supplementing of pastures with other classes of fodder crops has of recent years shown considerable advancement in the district of the Lower Rivers.

On the Nambucca.

Farmers rely chiefly upon pastures, supplemented here and there by patches of Saccaline and some winter cereals, chiefly oats. The Nambucca is a fairly "safe" river, and artificial feeding is not resorted to to any extent. Pastures—paspalum, water couch, clover—seem to come sooner and to last better than on the larger and more exposed dairying rivers.

The Macleay.

Although this river is subject to dry periods in the late winter and spring months, the Macleay farmer makes only a feeble attempt to supplement the pastures at that time, with the result that cream supplies dwindle considerably towards August and September. The conditions are ideal for maintaining ample fodder supplies. Lucerne—in fact, every class of crop—grows to perfection, but in spite of the fact that lean periods frequently "stare the farmer in the face," his attempts to combat them are negligible. Furthermore, the farms, especially on the lower river, are heavily stocked. Certainly one sees odd patches of Saccaline, field peas, and other small areas with oats and barley, but the attempt is only a fraction of what could and should be done. It is not an uncommon experience to have free offers of seed for trial purposes "turned down" by some farmers on this river. The reason chiefly given is that more labour has to be kept where fodder crops are grown, and suitable farm hands are difficult to find. Fortunately, the "up-river farmer" is not so apathetic. One sees considerable areas sown to lucerne, oats, peas, &c., around Sherwood, Toinagog, and other parts.

The Hastings.

On the upper parts of this river some provision is made for the late winter months. Lucerne is grown, and oats have proved a valuable fodder for the time of the year. Saccaline, too, is available. Still, there is ample scope for increasing supplies, especially around Wauchope and the areas lower down.

The Manning.

On the Manning and its tributaries fodder-growing has gained a decided foothold. Saccaline, oats, and wheat are available in large quantities for late winter use. Lucerne areas, too, are increasing, but there is ample scope for more of this class of crop. Dairy-farmers, on the whole, realise the importance of having liberal supplies of fodder available during the winter months, and considerable credit must be given to some of the Agricultural Bureau branches on this river, notably those at Hannam Vale and Dumaresq Island, for the encouragement given to farmers by the stand they are taking in conducting annual competitions in winter fodder growing. Handsome trophies, presented by a retired member in the first instance, and by the Chilian Nitrate Proprietary in the second, have given a decided impetus to fodder-growing in these neighbourhoods.

Districts Further South.

Further south, around Gloucester and Dungog, Patison and Gresford, the areas of river flat soils are less extensive than on the above-mentioned

rivers; still winter fodder-growing is becoming more general, especially in the Bandon Grove and Gresford districts. Lucerne is more largely grown here, and considerable quantities in the form of lucerne hay are always more or less available.

The same applies to the Hunter, where lucerne also plays an important part in the dairying industry. Saccaline and cereals are gaining ground as supplementary fodders.

Conclusions.

In summing up, it may be stated that greatest advancement in solving the fodder-shortage problem has been made where Agricultural Bureau branches are conducting local competitions. The additional attraction of having prizes and trophies to compete for has created a very lively interest. It is hoped that further interest will be created during 1926 by conducting a district championship for a fodder plot on the Manning River and surrounding parts, the winning entry in the Hannam Vale, Dumaresq Island, and other branches to automatically compete for a trophy presented for the purpose. Other branches of the Bureau and agricultural societies might well adopt the idea—the main object being to stimulate interest in the growth of winter cereals to cover the months of the year—August and September—when fodder is sparse.

Crops.

The season was not a satisfactory one as far as winter fodders were concerned. A very wet late autumn hindered the proper cultivation of the soil, with the result that, in addition to some plots being abandoned, the majority of the early-sown plots were poor, being stunted, yellowish, and much below the average. In consequence some were too poor and uneven to weigh, so were, for convenience, fed off. In addition, the winter was cold, dry, and frosty. The late April and May sowings turned out better. More time was taken in the preparation of the soil, and the plots ran into better conditions in the late winter. In no instance, however, did the yields exceed the ordinary.

Some good late private plots were seen, chiefly amongst those sown by Agricultural Bureau members. More attention was taken in the preparation of the soil, and fertiliser was used. The value of an application of fertiliser has repeatedly been brought under the notice of farmers, but only a few, so far, appreciate its value.

Sunrise oats is by far the most popular variety of fodder grown, and it stands out prominently as the best of the winter fodders. The legumes for this season were failures, due to the rather dry conditions. Of the newer varieties of oats, Belar showed considerable promise, coming in much earlier than Sunrise. Myall lodged badly in places, and Algerian was practically a failure.

Florence is the most popular variety of wheat, and for an early supply of fodder it stands alone. Gresley and Warren (later varieties) yielded well here and there, but neither are likely to oust Florence from its popular position. Trabut and other barleys were failures; they required more rain.

RESULTS of Winter Green Fodder Trials, Lower North Coast.

Variety.	Paterson.	Hunting-don.	Taree Estate	Mt George	Dumar-esque Is.	Tinonee.	Vacy.	Mon.-drook.	Gresford.	Gladstone.	Jones Is	Oxley Is.	Markwell.
	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
Sunrise oats	7 0	7 1	...	11 9	...	8 4	14 6	10 9	16 0	10 5	...	...	8 0
Sunrise and vetches ...	...	...	...	11 18	11 10	...	11 17	11 1	15 0	...	...	...	(approx.)
Sunrise and peas ...	...	...	...	12 8	...	...	16 11	...	16 16	...	...	...	...
Guyra oats	...	5 18	...	...	...	...	17 17	12 14	16 5	...	...	...	...
Algerian oats	...	...	...	...	...	...	...	...	13 2	...	...	...	...
Algerian and vetches ...	...	...	...	8 18	...	...	...	...	...	...	...	...	...
Algerian and peas ...	...	...	...	8 16	...	...	...	8 5	...	...	...	...	...
Mulga oats	...	...	8 17	...	10 12	6 2	17 10	...	...	...	...	...	...
Mulga and vetches ...	...	...	...	...	...	...	17 12	12 4	...	...	...	...	...
Myall oats	...	...	...	10 10	...	6 8	...	12 4	...	...	...	...	...
Belar oats	...	...	...	10 2	...	6 15	16 8	10 5	...	...	...	...	...
Trabut barley ...	...	...	...	...	...	...	...	...	15 19	6 15	...	...	...
Florence wheat ...	6 0	5 18	5 2	11 14	...	...	...	...	...	8 15	6 0	10 0	...
Florence and vetches	...	...	...	11 7	...	...	...	...	...	...	...	...	...
Florence and peas ...	...	...	...	...	14 17	...	...	...	...	...	...	...	...
Gresley wheat ...	...	...	...	10 19	...	...	...	...	...	...	6 8	...	...
Warren wheat ...	...	7 2	6 17	8 9	...	...	...	3 14	...	12 14	6 8	...	...
Firbank wheat ...	...	...	...	...	...	...	...	10 5	...	...	...	...	...
Warren and peas ...	...	...	...	...	12 6	...	...	5 10	...	...	...	...	...
Canberra wheat ...	...	...	...	...	...	...	...	10 14	...	...	...	...	...
Wandilla wheat ...	...	...	...	10 16	...	...	...	...	...	...	...	...	...

Combination Plots.

In experiments at Cowra Experiment Farm a mixture of wheat and oats has given heavier yield and has had other prominent features compared with individual varieties sown alone. Varieties maturing about the same time were used, one bushel each of wheat and oats in the combined plots, and two bushels of each in the separate plots. At Bandon Grove the farmer stated that with Mulga, a variety that lodges badly, the addition of the wheat prevented lodging, and the leafiness and fineness of stem stood out in comparison with the separate plots of oats. The following were the yields:—

	t.	c.	q.	
Sunrise oats alone	10	10	2	
Sunrise and vetches	9	18	2	
Sunrise oats and Warren wheat	10	2	3	
Sunrise, Warren and vetches...	10	7	0	
Warren wheat	11	15	2	
Mulga oats	7	17	3	Lodged badly.
Mulga and vetches	7	12	0	
Mulga oats, Warren wheat and vetches ...	9	8	2	
Mulga and Warren	8	12	3	

Careless Use of Arsenical Preparations.

It is easy to pay too little attention to the storing of poisons on farms, for although farmers recognise that the material is dangerous, they are sometimes careless, and mortality results. Following are some cases which were brought under the notice of the Department recently:—

Case 1.—A farmer stored an old tin of arsenic dip powder in a shed. The shed was burned down and the cattle gained access to the site and chewed the charcoal. Some licked the remains of the dip powder and died of arsenic poisoning.

Case 2.—The refuse from a dip was thrown out alongside the dip into a small yard that was fenced off. The gate was inadvertently left open and the cattle licked up some of the refuse. Three cattle died from the effects of arsenic poisoning.

Case 3.—Arsenic was used to destroy white ants in a house. The unused arsenic was buried near the house in a sandy patch. Cattle pawed the place and licked the sand. Deaths from arsenical poisoning resulted.

Case 4.—A drum of arsenical dip concentrate was left in a paddock. The stopper was not secure and some of the mixture ran out and was licked up by cattle. Six cattle died from arsenical poisoning.

The foregoing emphasize the importance of care in the handling of arsenical preparations and the possible costliness of neglect.—W. L. Hindmarsh, District Veterinary Officer, Armidale.

The dairy-farmer and the cow are partners in milk and butter production, and it is well to treat the partner well. If dogs are set on to the cows the cream will be less in quantity and poorer in quality—an excited cow cannot give good quality milk and cream.—A. S. Pankhurst, at Dorrigo Bureau Conference.

Field Experiments with Winter Fodders.

COWRA EXPERIMENT FARM.

J. A. O'REILLY, H.D.A., Experimentalist.

THE winter fodder trial conducted at the farm during 1925 was carried out as a feeding-off test with the following crops :—Slav rye, Skinless barley, Mulga oats, Cape barley, Sunrise oats, Gresley wheat.

This year the method of conducting the test was altered with a view to obtaining data as to actual carrying capacity and palatability, and to allowing crops to recover and be fed off several times. Plots of 1 acre in extent were sown, and for feeding-off purposes were temporarily fenced.

The practice of growing winter fodders is a very sound one. These crops provide a succulent form of fodder for lambing ewes at a time when natural feed is very scarce. They are also a valuable substitute for lucerne when that fodder is not available for grazing purposes.

The experiment was sown on fallowed land which had been under wheat during 1923. The land was mouldboard ploughed 1st August, 1924, and spring-tooth cultivated on 5th September. A second ploughing was given on 10th January, 1925, and a spring-toothing on 20th February. Subsequent working of the fallow consisted of a discing with the sundercut 10th March, and a stroke of the spring-tooth a couple of days prior to sowing, which took place on 25th March.

Sowings were made at the rate of 1 bushel per acre in each case, and superphosphate was applied at 60 lb. per acre.

The germination on the whole was only fair; the oats and rye especially exhibited a poor stand. The plots made appreciable growth following the rains in May, and were ready to feed-off about the middle of June.

The rainfall during the growing period was as follows :—

	Points.
March 25th–31st	62
April	46
May	283
June	791
July	154
August	131
September	31
Total	1,498

Notes on the Plots.

Slav Rye.—This plot was well in ear when sheep were turned on, and was not fed off to advantage. The subsequent growth was more palatable.

Skinless Barley.—This crop was about 12 inches high when first fed off. It was eaten readily and was only 2 inches high when sheep were removed.

Mulga Oats.—Oats were in ear at time of feeding-off, the subsequent growth, however, was soft and succulent.

Cape Barley.—This crop was 12 inches high when first fed off. It provided an abundance of soft succulent fodder.

Sunrise Oats.—Were in ear when first fed off; produced an abundance of feed but not as palatable as Mulga.

Gresley Wheat.—This crop was 2 feet high at the time of first grazing, and was eaten readily. It made a good recovery.

From observations the palatability of the crops is in the following order:—Skinless barley, Cape barley, Gresley wheat, Mulga oats, Sunrise oats, Slav rye.

The table of results furnished hereunder shows the number of sheep carried on each crop for periods of so many days each month, and the total number of days in each case. The final column shows the carrying capacity of each crop in days per hundred sheep.

Crop.	No. of Sheep.	No. of Days per Month. July.	August.	Sept.	Oct.	Nov.	Total days.	Days per 100 sheep per acre.
Sunrise oats ...	54	10	...	5	...	...	15	12·95
	40	...	...	...	7	...	7	
	41	...	...	...	...	5	5	
Gresley wheat ...	54	9	...	5	...	...	14	12·51
	40	...	...	.	7	...	7	
	43	...	...	...	...	5	5	
Slav rye ...	57	...	11	7	...	..	18	11·94
	42	...	..	...	...	4	4	
Cape barley ...	54	7	...	5	...	..	12	11·33
	40	...	...	...	7	..	7	
	41	...	...	..	..	5	5	
Mulga oats ...	57	...	11	4	..		15	10·23
	42	...	...	...	...	4	4	
Skinless barley...	57	...	10	4	.	...	14	9·66
	42	...	...	...	...	4	4	

Some of the Advantages of Silage.

Silage keeps cows wonderfully healthy. If, after a bad winter they get low in condition, they should be brought in and hand-fed. We have found that in a week they will brighten up, and in a month will fatten with the help of a little concentrate, such as bran or cracked maize or lucerne chaff. Silos are satisfactory to keen farmers, because they enable them to get milk when others are short of feed and milk is dear. One bad year on the South Coast losses of stock reached 30 to 40 per cent. At Tilba the loss was 1 per cent., and some farmers actually drew their highest cheques during this period. In a silo your feed cannot be harmed by rain, wind, fire, flood, frost, hail, or drought.—H. J. Bate, junr., at Bega Agricultural Bureau Conference.

Soil Fertility.

Its Maintenance and Improvement by means of Green Manure and Cover Crops.

[Continued from page 36.]

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

Regional Distribution of Such Crops.

Having considered what crops are largely available for selection as soil-improvers, let us see which are best adapted for different districts.

The need for soil improvement by the addition of organic matter becomes easily most marked in those climates where this matter decays most rapidly in the soil, and is therefore diminished in supply, and where the addition of organic or vegetable matter is most beneficial. It has been previously shown that organic matter decomposes most readily in the soil under conditions of warmth and moisture, such as obtain in the climate of the coastal districts, particularly on the North Coast. It would naturally be expected that here, under certain conditions, the utilisation of the crop as green manure would be most needed. Under heavy rainfall conditions, too, much nitrogen is leached from the soil, and the addition of vegetable or organic matter of leguminous origin becomes more necessary.

The continued cultivation of inter-tilled crops and clean cultivation, such as is practised in orchards, help to destroy the organic matter of the soil more quickly than the growing of crops which do not require tillage, and these are the conditions (other things being equal) under which soil-improving or green manuring crops will be found to be primarily needed Naturally strong fertile soils, of course, stand much more cropping than mediocre or poorer soils, and on the latter recourse must be had to soil improvement by this means comparatively early in their life.

The choice of soil-improving or green manuring crops available to the farmer according to his district is broadly as follows:—

Upper North Coast (big scrub and surrounding districts).—On the far North Coast, in the specialised dairying districts of red volcanic soils, where paspalum grass is chiefly relied on for feed, only small areas of the farm are given over to cultivation, the chief crops being maize or sorghum for green fodder and oats for grazing. With the desire to keep the cultivation paddocks handy, some of these areas are kept under cultivation with alternate crops of maize or sorghum and oats for many years, a practice which is soon reflected in the declining yields of these crops. The paspalum pastures also suffer from not being periodically ploughed, and such a system results in poor production all round. A rotation system of pasture and cultivation for a few years where practicable is the best means of maintaining the organic fertility of such soils (to which phosphates at least should also be added for the maintenance of mineral fertility), but where such a system is impracticable or difficult, some other means of maintaining

the organic fertility of the soil must be devised. The systematic spreading of animal (chiefly cow) manure on the small areas of cultivation would assist considerably, but where the supply is insufficient for the areas cultivated, soil-improvement crops must be given attention.

Of these the most promising for this district is velvet beans. They are as yet little known, but where they have been tried they have given excellent results. Velvet beans make more growth than any variety of cowpeas here, and have the further advantage that they are much more palatable to stock. A possible disadvantage is that they are much later in maturing, but this is not a great fault, for the crop may be pastured or turned under for green manure at any stage, though it may not have reached its best development or growth. This crop is best fitted into the regular farm practice just after the oat crop, being sown about November in place of portion of the usual maize or sorghum, using the velvet bean crop for grazing or green manuring as desired. As grazing, velvet beans supply much-needed proteins to the dairy cows in autumn, a time at which they are of much value for continued milk production, and the organic fertility of the soil is benefited greatly when they are utilised in part or wholly as green manure.

Dolichos beans (*D. lablab*) are little known as yet, but they are perhaps only little inferior in all respects to velvet beans.

Pigeon peas are largely grown in Hawaii, where they are valued highly as a summer legume for hay or grazing and as a soil-improving crop. They are being tried out in this district.

On account of the much better summer rainfall in this district, winter legumes are not in such favour, as they do not make the same amount of growth.

Lucerne and the biennial clovers—with the possible exception of Bokhara, which is of a hardier nature—are practically out of the question on account of climatic and soil limitations.

Upper North Coast (sugar cane districts).—The need for improving the organic and nitrogen content of the soil is very apparent in districts where sugar cane is the principal crop. This crop occupies the land so long and makes such a heavy drain on the fertility, even on good alluvial soils on the Tweed, lower Richmond, and lower Clarence Rivers, that green manuring is already well recognised as an essential practice. Up to the present cowpeas have been largely used as a catch crop, sown at the last cultivation of an early-sown maize crop, and this system has been productive of fairly good results. Velvet beans are, however, beginning to be grown, and are proving more suitable than cowpeas; they produce a greater bulk, which, when turned under, maintains fertility better for the long period of cane growth. When sown with maize for grain, velvet beans produce such a mass of heavy twining growth that they drag the maize stalks down and interfere somewhat with the harvesting of the grain. It is recommended, therefore, that instead of sowing the maize in the usual manner in rows 4½ feet apart, two rows of maize should be sown 3 feet apart with a space of 6 feet between these and the adjoining rows. By this

means the same number of rows is sown per acre as with the usual method. In the 6-foot interspaces the velvet beans should be sown about six weeks or two months later than the maize, so that by the time the maize is ready to harvest for grain the beans have not entirely overgrown the maize stalks, and the harvesting of the maize is not rendered difficult. There is a desire on the part of cane-growers, who are usually working on comparatively high-priced land, to restore the fertility depleted by the cane crop without losing too much time and without seemingly wasting too much land in growing purely soil-improving crops. The common practice, therefore, is to get some direct cash or farm value from the land by growing a maize crop and a green manuring crop at the same time. Under such circumstances, and with the methods outlined above, it is thought that velvet beans will prove much superior to cowpeas.

Soy Beans at Emu Swamp, near Orange.
The crop was grown on a poor white pipeclay soil in a very dry season

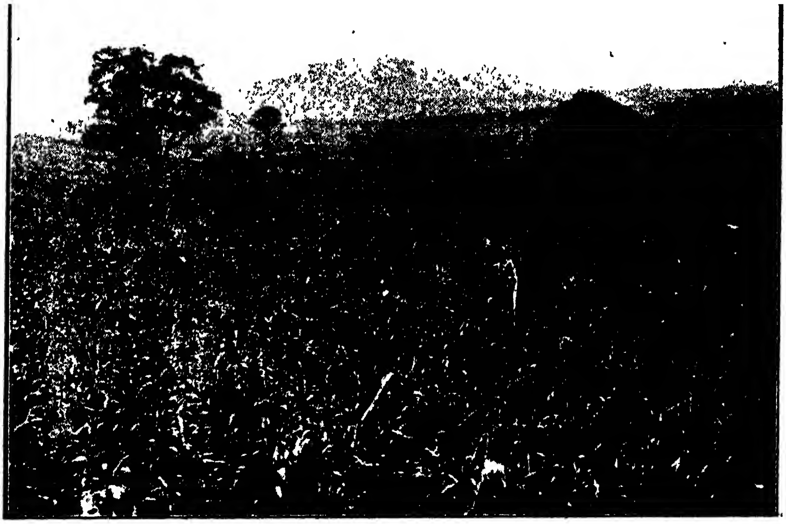
The remark as to the value of dolichos beans may here be repeated.

Late varieties of cowpeas, which produce a large growth, are the kinds at present most largely in use.

These, for the economic reasons mentioned, are practically the only crops largely used for soil improvement in these areas. Winter legumes, such as field peas, vetches, &c., do not make sufficient growth to meet the drain on fertility from four years' cane immediately to follow. Annual Bokhara clover may be worth trial on account of its fast growth, but the biennial clovers and lucerne (even if they can be grown economically) may be regarded as taking up too much time under the circumstances to grow here mainly for soil improvement at present.

North Coast (maize land).—Where maize has been grown for many years, even on good alluvial land which is not regularly flooded, the continuous cropping makes its effect on the land noticeable sooner or later, and this is particularly the case under the climatic conditions of the North Coast. It is a matter of some doubt, however, unless such land has been badly depleted in fertility, or unless the soil is not naturally very rich (as with volcanic

or upland soils), whether the taking up of a whole or a large portion of the maize season for a soil improvement crop would be justified, and, except under the conditions mentioned, long season crops, like velvet beans, pigeon peas, &c., are not considered on present experience as best adapted to fit in



Green Fodder (Rye) sown in Maize at the Last Cultivation.
Dorrigo Tableland.

Perennial Red Clover on Rotation Plots at Glen Innes Experiment Farm.

here. It is not yet certain in what circumstances it is going to be even advantageous to allow a maize crop to be missed at all and a soil improvement or green manuring crop to take its place, but this is being investigated. The method of soil improvement most favoured by maize-growers on

alluvial land, however, is to grow a leguminous catch or cover crop without missing a maize crop or without disturbing the regular rotation or main cropping practice of the farm. In the longer season districts of the North Coast, such as the Richmond and Clarence River districts, and the lower parts of some of the rivers a little further south of these, soil improvement may be effected by the use of cowpeas sown in an early-planted maize crop at the last cultivation, which takes place about November. This practice is extending on the Clarence River particularly. The cowpeas do not make very marked growth until the maturing maize crop begins to allow more sunlight to reach the ground, but by the time it is fully mature (about January) the cowpeas have made fairly good growth, and this is allowed to continue for a month or so after the maize is harvested before ploughing in the cowpeas as green manure.

Soy beans have not been able to compete with cowpeas as a summer green manure crop on the North Coast, because they do not produce as much bulk; but some more promising varieties in this respect are now being tried, and if they compare at all favourably with cowpeas, they may be chosen by some farmers here because of their much greater palatability and feeding value to stock, especially pigs. The best way of fitting them into the cropping system on the North Coast on maize land would be as described above with cowpeas—in early-sown maize at the last cultivation—particularly where pigs or even cattle are allowed to harvest the maize crop or to get some grazing value from the maize stalks after harvest.

On the Macleay River, the favoured practice is to grow an early-maturing maize, get it off quickly, and plough the ground and plant field peas, which are grazed off in late winter or early spring by dairy cows and the residue or an aftermath ploughed in as green manure. This plan seems to be productive of better results than planting a winter crop like field peas, vetches, &c., in late-sown maize at the last cultivation, about February. This latter plan has been repeatedly tried with late maize on the Clarence (where more late-sown maize is grown than early-sown maize), but except in odd seasons, it has not met with much success. Peas and vetches sown under such conditions do not seem to grow much before the maize in dying off allows the sunlight to reach them, and by this time weeds such as stagger weeds, potato weed, and chickweed (which are apparently able to develop quickly even when shaded by the crop), have made sufficient headway to prevent much development of the winter legume. Even other winter crops, such as rape or the clovers, have fared little better, and no promise can at present be looked for in a system of soil improvement which utilises these winter crops as catch crops in maize in this way. If used at all, they should be used after the manner of field peas on the Macleay—after an early maize crop is off. This practice, however, cannot be carried too far south, for not only is there insufficient time for the peas to make much growth between consecutive maize crops, but on the rivers further south, the practice of sowing so much early maize is not so general, and it is still later when the land can be ploughed after maize. Further south, however, soil-improving crops are not generally so badly needed, because the comparatively cooler

climate does not exhaust the organic matter of the soil by decomposition so quickly. This is not to say that soil-improvement crops are unnecessary further south on the coast, but that by comparison maize can be grown continuously for a longer period in the south than in the north—other things, of course, being equal.

Lucerne is the outstanding soil-improvement crop among those of perennial or biennial habit for maize land on the North Coast. It is not likely to be grown with this sole object anywhere, but it has such a high value in improving the soil fertility after its period of primary usefulness is over that it calls for more systematic use on the farm in different areas with a view to getting the benefit of its residual effect on subsequent crops. In view of the bulk of grazing it affords during growth, and its high residual fertility value, Bokhara clover is not altogether without merit. Dairymen might

A "close-up" of Velvet Beans at Wollongbar Experiment Farm.

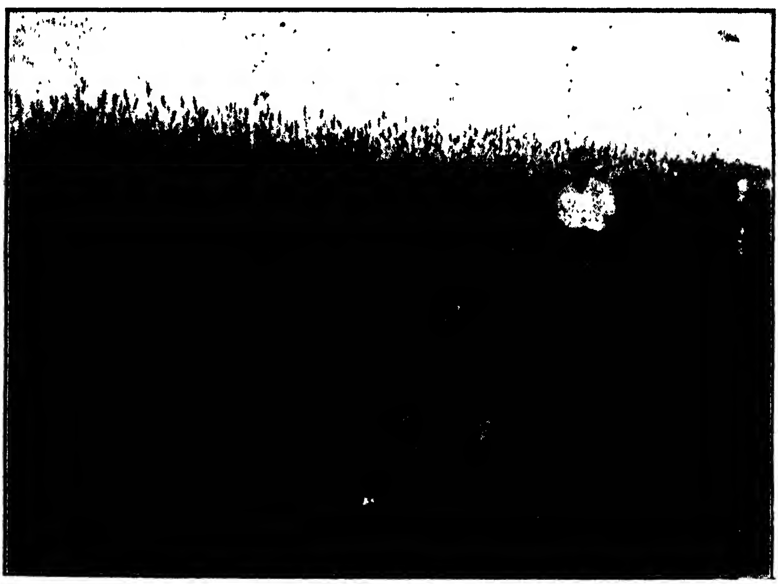
note that it has a tendency to taint the milk, but this can be obviated largely by keeping the cows off this grazing for a few hours before milking, and any taint largely removed by well aerating and cooling the milk soon after drawing.

On other than alluvial maize land on the North Coast soil-improving crops would be more largely used as green manure crops.

Central Coast.—On the Central Coast there is not generally much possibility of getting summer legumes such as cowpeas, &c., to grow sufficiently well when sown as a cover crop in maize at the last cultivation unless a very early variety of maize is used and sown early, so that the cowpeas may get the benefit of some of the warmer summer weather unshaded by the crop. If such summer legume is grown it is best fitted in after a green winter fodder which comes off about October, which is not usually a good crop to follow with maize. Sorghum is a better crop than maize to follow wheat or oats, and where some soil-improving or green-manuring crop is felt to be

necessary, it may take the place of part or the whole of this sorghum crop after the winter green feed, which has a peculiar temporarily (at least) exhausting effect on the soil fertility, as well as a bad effect on the physical condition of the soil. If soy beans are grown in this district, they would be best grown in the same way. Generally also there is not sufficient time between maize crops on the Central Coast to grow a winter legume like field peas or vetches, though these may be grown after an early green fodder crop of maize.

It has been previously stated that on the North Coast winter legumes have not been very successful when sown at last cultivation (about February) in late maize. This may not apply so much on the Central Coast, but there is not enough maize planted late on the Central Coast to enable this practice to be much applied.



Soy Beans (Biloxi Variety) at Grafton Experiment Farm.
Sorghum in the background.

Lucerne utilised as described earlier is regarded as the best soil-builder for maize on alluvial land, and as previously mentioned, Bokhara clover is worth more than a passing thought if quick soil improvement is desired.

Away from the river and creek flats, the annual leguminous crops need to be fitted in more often, if not wholly utilised as green manure.

South Coast.—On the South Coast, where they receive more regular floodings and natural enrichment from silt, and where the cooler climatic conditions exhaust the organic matter less quickly than on the North Coast, the alluvial soils do not stand in such need of soil rejuvenation or improvement in soil fertility, but the addition of organic matter now and again helps to improve the crop yields. On the upland soils in this districts, which

are repeatedly cropped with exhausting green fodder crops, such as maize, sorghum and oats, the need for soil-improving crops is urgent. On those alluvial soils which do eventually require some improvement in the content of organic matter, the soil-improvement crop best takes the form of a winter legume sown in the maize (which is generally a later-maturing variety) at the last cultivation. This may either be field peas, vetches, or some of the annual clovers such as Crimson, Berseem, or Subterranean. Lucerne or the biennial clovers (Perennial Red or Chilian) do sufficiently well to justify being grown for their own sake, but they also have a markedly beneficial residual effect on the soil. It is fairly patent that the upland soils cannot stand for very long the exhausting cropping with summer and winter green fodders which they usually get. Summer legumes (cowpeas or soy beans) fitted in on portion of the land after oats, or winter legumes (field peas, vetches, or annual clovers) after early fodder maize offer temporary respites from the exhaustive cropping, but the biennial clovers (Perennial Red, Chilian or Bokhara) enable a more permanent improvement in soil fertility as well as providing extremely valuable hay or grazing on the dairy farm. Of these biennial clovers, Bokhara is more suitable than the others on the poorer shale or granite soils.

Tableland Districts.—The biennial clovers are well worth consideration for introduction into the regular cropping systems in these districts. In the cooler parts (potato districts) sowing with the oat crop in autumn or spring has proved very successful, and not only has excellent grazing feed for sheep or cattle been secured for fifteen to eighteen months after the oaten hay crop is removed, but the improved soil fertility which is reflected in the subsequent crop of potatoes or maize is very marked.

Soy beans are grown largely in America as a summer crop in cool climates as an emergency hay or grazing crop where clover fails or where a short season crop is desired to allow of the ground being well prepared for a subsequent wheat or oat crop. They have been thus utilised by a few farmers in this State, but the use of soy beans is by no means general. Cowpeas are mostly out of the question in tableland districts.

Western Districts.—In the drier western districts, the growing of special crops for green manuring is mostly a wasteful and unnecessary practice, as well as being generally harmful. In the main wheat districts, where fallowing is so beneficial, any practice which reduces the moisture supply in the soil for the wheat crop should be avoided. Organic matter is best added to the soil by the indirect means of the manure from grazing stock. Non-leguminous crops such as oats are chiefly sown for this grazing, and only in a few favoured districts are leguminous crops such as field peas worth considering.

Murrumbidgee Irrigation Area.—Use can be made of the good winter rainfall to grow good crops of field peas, vetches, tick beans, or annual clovers, which can here be left to grow well into spring, for the drying out of the ground caused by such prolonged growth can be easily corrected by subsequent irrigation.

(To be continued.)

Reports of the External Parasites in Sheep Committee of the Departmental Research Council.

No. I.—Tests of Certain Swabbing Dressings for Prevention and Treatment of Sheep Blow-fly Attack.

[Continued from page 44.]

Dressing "D."

Test No. 1.—Date of swabbing, 10th November, 1922.

Sheep Used.—One-hundred ewes, free from fly-blow.

Formula of Dressing.—25 gallons of water, 25 gallons wood preserving oil, 10 lb. hard soap, 2 lb. arsenic, 1 lb. 7 oz. washing soda.

Report to 22nd November, 1922.—During first twelve days after swabbing two ewes were slightly struck.

To 9th December, 1922.—During next seventeen days no ewes were struck. Ewes very discoloured with dressing, and it was therefore difficult to tell if they were fly-blown. This dressing scalded quite a number of sheep, causing the wool to lift off the skin. Practically no fly since experiment started.

To 21st December, 1922.—During next twelve days one ewe struck.

To 9th January, 1923.—During next nineteen days two ewes struck.

To 31st January, 1923.—During next twenty-two days one ewe struck.

Report adds.—Practically no fly; only prevalent during early January, and latter part of May.

Conclusion.—Indefinite; practically no fly.

Test No. 2.—Dates of Swabbing: 14th January, 1924 (first swabbing); 25th March, 1924 (second swabbing).

Sheep Used.—Fifty Merino ewes, dipped on 1st December, 1923. Controls, thirty-seven ewes.

Formula of Dressing.—25 gallons water, 25 gallons "Rangoon" oil, 10 lb. hard soap, 2 lb. arsenic, 1 lb. 7 oz. washing soda.

Method of application.—With swab or small mop to crutch and around and above tail.

Report of 10th July, 1924:—

During first fifty-seven days, one ewe struck. Flies now active.

During next thirteen days, one ewe blown, ten crutched; controls—one blown, three crutched. Flies very active; swabbed.

During next three days, no ewes blown; controls, one ewe blown. Nine days later ewes commenced lambing.

During next thirteen days, one ewe blown; controls, one ewe blown.

During next five days, one ewe blown.

During next nine days, three ewes blown.

During next nineteen days, one ewe blown; controls, three ewes blown (two badly).

During next seventeen days, two ewes blown (one of which blown and left). Flies not so active.

During next five days, ewes finished lambing. Flies not active; no ewes blown after last record.

At the commencement of the experiment blow-flies were not active. All blown ewes were crutched and swabbed with dressing. In every case the flies struck on the crutch or tail. Control ewes that were struck were swabbed with same dressing.

	Dressed Sheep Struck.	Control Sheep Struck.
Struck between first and second swabbing	2	1
Struck after second swabbing	8	5
Totals...	10	6
Equal to	20 per cent.	16 per cent.

Conclusion.—Results slightly against dressing; fly almost inactive.

Test No. 3.—Date, 1st November, 1923.

Sheep Used.—One-hundred ewes treated and 100 left untreated as controls. No crutching done until a ewe was struck, and then the wet and dirty wool was removed before being treated again with the dressing.

Dressing used as for Test No. 2.

Report of 21st June, 1924.—Blow-fly quite inactive for almost three months after first application.

	Dressed Sheep Struck.	Control Sheep Struck.		Dressed Sheep Struck.	Control Sheep Struck.
During 1st month	0	0	During 5th month	16	23
,, 2nd ,,	0	0	,, 6th ,,	35	30
,, 3rd ,,	1	8	,, 7th ,, (24 days)	17	18
,, 4th ,,	22	29			
			Totals ...	91	108

Report adds:—It was noticed that very few were struck again, and these were found to possess wrinkles.

Conclusion.—Dressing of no value. Fly inoperative during first two months.

Test No. 4.—Date, 17th October, 1924.

Sheep Used.—Fifty ewes swabbed and then boxed with flock of 150 others.

Dressing Used.—2½ gallons water, 2½ gallons wood preserving oil, 1 lb. soap, 3¼ oz. arsenic, 2¼ oz. washing soda.

Report of 3rd March, 1925:—

	Dressed Sheep Struck.		Control Sheep Struck.	
	No.	Per cent.	No.	Per cent.
During 1st fortnight, November	7	14	7	4
,, 2nd ,, ,,	6	12	9	6
,, 1st ,, December	4	8	11	7·3
,, 2nd ,, ,,	3	6	8	5·3
,, 1st ,, January	4	8	4	2·3
,, 2nd ,, ,,	6	12	7	4·6
,, 1st ,, February	7	14	10	6·3
Total for four months ...	37	= 74	56	= 37

Conclusion.—Dressing of no value; apparently predisposed to infestation. During first month, result against dressing; next one and a half months, of no benefit; subsequent results, against dressing.

Test No. 5.—Date, 13th March, 1925.

Sheep Used.—Thirty-seven Merino ewes; dipped 6th January, 1925; mated, 1st December, 1924. Controls, 53 sheep.

Method of Application.—As a swab.

Composition.—As for Test No. 2.

Report of 12th August, 1925 :—

	Dressed Sheep Struck.	Control Sheep Struck.		Dressed Sheep Struck.	Control Sheep Struck.
During 1st fortnight	0	0	During 5th fortnight	0	2
„ 2nd „	0	0	„ 6th „	2	1
„ 3rd „	0	0	„ 7th „	2	1
„ 4th „ (lambing commenced)	0	0	Totals	4	4
			Equal to ...	10·8 per cent.	7 5 per cent.

Conclusion—As so few sheep were struck, test must be considered inconclusive. No apparent benefit was conferred by the dressing.

Summary.

As a Cure for Sheep Blow-fly.—Said to kill and dislodge maggots.

As a Preventive against Sheep Blow-fly Attacks.—Of no value.

Toxicity.—None observed.

Effect on Wool.—Inclined to stain and mark wool when wood preserving oil is used in composition.

Effect on Wound.—Emollient.

Ease of Application.—Easily applied when luke-warm, but forms a jelly when cold.

Persistence.—Not observed.

Dressing "E."

Test No. 1.—Date, 31st October, 1921.

Sheep Used.—One-hundred ewes.

Treatment.—Swabbed on crutch with mixture, which was rubbed well into the wool.

Report of 10th April, 1922 :—

(1) The dressing dislodges any maggots on the sheep which had been struck, besides killing those that it came directly in contact with.

(2) The oil remained in the wool for a considerable period, and repelled any subsequent attack for at least three months.

(3) No injurious effects to the sheep or the wool were noticed.

Compared with Dressing D, less of the dressing was required in the treatment of the sheep. Blow-flies were fairly numerous at the time trial was conducted.

Conclusion.—Said to have given better results than other dressing tried at the same time. No figures given.

Test No. 2.—Sheep Used.—Twenty badly struck ewes (impossible to find 100).

Treatment.—Swabbed on crutch after crutching.

Report of 22nd May, 1922 :—

(1) Ten minutes after the application of the dressing the ewes were examined and no live maggots could be found on or round the affected areas.

(2) Only in one case did a ewe require a second treatment. A fortnight after the first application she became struck, and was found to be much urine-stained. It is surmised the urine had washed the specific off and spoilt its effect.

(3) As far as could be seen the wool was not damaged in any way, and wool was left cleaner in appearance than after the D dressing.

(4) Wounds dried and healed in a short time. Dressing was used on lambs after de-tailing, and they healed quickly, and without any inflammation.

(5) The period under review was a very troublesome one as far as blow-flies were concerned.

Conclusion.—Of twenty animals treated, only one required a second application of the dressing. This animal was struck a fortnight after first dressing, and as she was found to be much stained by urine, it is surmised that the urine had washed off the dressing.

Test No. 3.—Date of swabbing, 10th November, 1922.

Sheep Used.—One-hundred ewes, free from fly-blow.

Report of 20th December, 1922 :—

To 22nd November, 1922.—During first twelve days after swabbing, two ewes were slightly struck.

To 9th December, 1922.—During next seventeen days, two ewes badly struck. Practically no fly since experiment started.

To 21st December, 1923.—During next twelve days, four ewes struck.

To 9th January, 1923.—During next nineteen days, seven ewes struck.

To 31st January, 1923.—During next twenty-two days, no ewes struck.

Owing to the exceptionally dry weather conditions there has been practically no fly this summer. Only two mild attacks were experienced, one early in January any another during the latter part of May.

Conclusion.—Indefinite. Blow-flies not very active. Four sheep were struck during first twenty-nine days after swabbing, and eleven subsequently. As no control sheep were kept, it is impossible to estimate the value of the dressing. It did not entirely prevent sheep being struck.

Test No. 4.—Date of swabbing, 1st November, 1923.

Sheep Used.—One-hundred ewes treated and 100 left as controls. No crutching was done until a ewe was struck, and then the wet and dirty wool was removed before she was treated again with the dressing. Blow-fly quite inactive for almost three months after first application.

Report of 21st June, 1924.—It was noticed that very few were struck again, and these were found to possess wrinkles.

	Dressed Sheep Struck.	Control Sheep Struck.		Dressed Sheep Struck.	Control Sheep Struck.
During 1st month	0	0	During 5th month	21	23
„ 2nd „	0	0	„ 6th „	17	30
„ 3rd „	6	8	„ 7th „		
„ 4th „	17	29	„ (24 days)	19	18
			Totals ...	80	108

Conclusion.—Figures show apparently some benefit during the fourth and sixth months after swabbing, but as no benefit was conferred during the third and fifth months, no importance can be attached to these results. No sheep were struck during the first two months.

Taken over the whole period, while the result is slightly in favour of the dressing (80 per cent. against 108 per cent.), the difference is not sufficiently striking to create a favourable opinion. It is obviously of no lasting benefit when it allows 80 per cent. to be struck in less than seven months.

Test No. 5.—Date of swabbing, 14th January, 1924 (first); 25th March, 1924 (second).

Sheep Used.—Fifty Merino ewes (dipped on 1st December, 1923). Controls, thirty-seven ewes.

Method of Application.—With swab or small mop to crutch and around and above tail.

Report of 10th July, 1924 :—

During first fifty-seven days, none struck (fly now active).

During next thirteen days, six struck, sixteen crutched. Flies very active; swabbed. Controls, one blown, three crutched.

During next three days, one struck. Controls, one ewe blown. (Nine days later ewes commenced lambing).

During next thirteen days, one struck (previously blown and treated, very wrinkly tail). Controls, one ewe blown.

During next five days, one struck (third occasion).

During next nine days, one struck.

During next nineteen days, one struck. Controls, two ewes blown.

During next seventeen days, two struck. Flies not so active.

During next five days ewes finished lambing. Flies not active. No ewes blown after last record.

At the commencement of the experiment blow-flies were not active. All blown ewes were crutched and swabbed with dressing. In every case the flies were struck on the crutch or tail. Control ewes that were struck were swabbed with Dressing D.

	Dressed Sheep Struck.	Control Sheep Struck.
Struck between first and second swabbings	6	1
Struck after second swabbing	7	5
Totals	13	6
Equal to	26 per cent.	16 per cent.

Report of 18th August, 1924.—Satisfactory to apply; consistency of thin vaseline; no waste; ready for use.

Conclusion.—Indefinite on account of comparative freedom from fly. As far as results go they are against dressing.

Test No. 6.—Date, 13th March, 1925.

Sheep Used.—Twenty-four ewes; dipped, 6th January, 1925. Controls, fifty-three sheep.

Method of Application.—As a swab.

Report of 12th August, 1925 :—

	Dressed Sheep Struck.	Control Sheep Struck.		Dressed Sheep Struck.	Control Sheep Struck
During 1st fortnight	0	0	During 5th fortnight	0	2
„ 2nd „	0	0	„ 6th „	2	1
„ 3rd „	0	0	„ 7th „	0	1
„ 4th „ (lambing commenced)	0	0			
			Totals	2	4
			Equal to ...	8·3 per cent.	7·5 per cent.

Conclusion.—As so few sheep were struck, the test must be considered inconclusive. No apparent benefit was conferred by this dressing.

SUMMARY.

As a Cure for Sheep Blow-fly.—Said to destroy or dislodge maggots quickly.

As a Preventive for Sheep Blow-fly.—Except in one experiment unsupported by figures, where it is said to have given better results than other dressings,

the results either were indefinite on account of comparative absence of fly or indicated that it had no lasting preventive action. One dressing sufficed to prevent early reinfestation except in wrinkly or badly urine-soiled sheep.

Toxicity.—None observed.

Effect on Wool.—No injurious effects noticed.

Effect on Wound.—Wounds dried and healed in a short time. Used on lambs after de-tailing, the wounds healed quickly without reaction.

Ease of Application.—Satisfactory to apply. Consistency of vaseline, no waste; ready for use.

Persistence.—It was observed that the oil remained in the wool for a considerable period (duration not stated).

Dressing "F."

Test No. 1.—Date of Swabbing. 14th January, 1924 (first); 25th March, 1924 (second).

Sheep Used.—Fifty Merino ewes; dipped, 1st December, 1923. Controls, thirty-seven ewes.

Method of Application.—With swab and small mop to crutch and around and above trail. Dressing of liquid consistency and drips and wastes from swab.

Report of 10th July, 1924:—

During first fifty-seven days, none struck. Flies now active.

During next thirteen days, one struck, none crutched. Controls, one struck, three crutched. Flies very active.

During next three days, none struck. Controls, one struck. Nine days later ewes commenced lambing.

During next thirteen days, none struck. Controls, one struck.

During next five days, none struck.

During next nine days, three struck.

During next nineteen days, two struck. Controls, three struck.

During next seventeen days, four struck. Flies not so active.

During next five days, ewes finished lambing. Flies not active. No ewes blown after last record.

At the commencement of the experiment blow-flies were not active. All blown ewes were crutched and swabbed with dressing. In every case the flies struck on the crutch or tail. Control ewes that were struck were swabbed with departmental dressing.

	Dressed Sheep Struck.	Control Sheep Struck.
Struck between first and second swabbings (seventy days) ...	0	1
Struck after second swabbing (seventy-six days)	9	5
Totals	9	6
Equal to	18 per cent.	16 per cent.

Conclusion.—Of no apparent benefit.

Test No. 2.—Date, 13th March, 1925.

Sheep Used.—Thirty-seven ewes; dipped, 6th January, 1925. Controls, fifty-three sheep.

Method of Application.—As a swab.

Report of 12th August, 1925 :—

	Dressed Sheep Struck.	Control Sheep Struck.		Dressed Sheep Struck.	Control Sheep Struck.
During 1st fortnight	0	0	During 5th fortnight	1	2
„ 2nd „	0	0	„ 6th „	0	1
„ 3rd „	0	0	„ 7th „	2	1
„ 4th „ (lambing commenced).	0				
			Totals ...	3	4
			Equal to ...	8·1 per cent.	7·5 per cent.

Conclusion.—As so few sheep were struck, test must be considered inconclusive. No apparent benefit was conferred by this dressing.

SUMMARY.

As so few sheep (controls as well as dressed) were struck in these experiments, it is not possible to express any opinion as to the value of this dressing.

Dressing "G."

Test No. 1.—Date, 25th February, 1925.

Solution.—6 lb. arsenic in 100 gallons water. (No soda was used in dissolving the arsenic). Applied with a swab.

Sheep Used.—One-hundred weaner ewes (crutched 13th February, 1925). Controls ninety-nine ewes from same flock.

Prevalence of Flies.—Flies were troublesome at the time, and neighbours were having considerable trouble.

State of Sheep.—The crutches of these weaner ewes were particularly attractive to the fly, owing to folds, wrinkles, and decaying wool and urine.

Report 11th May, 1925 :—

	Dressed Sheep Struck.	Control Sheep Struck.	Dressed Sheep Re-struck
During 1st fortnight	0	0	0
„ 2nd „	3	4	0
„ 3rd „	13	12	0
„ 4th „	11	23	2
„ 5th „	11	14	5
„ 6th „	10	7	0

Conclusion.—Except during the fourth fortnight, the dressed sheep showed no advantage over the controls. The insignificance of the results during this period will be apparent from an examination of the detailed results given above.

The figures for the first three months after swabbing showed :—Dressed, 48 per cent. struck; untreated, 60 per cent. struck. Any treatment which allows such a large percentage of sheep to be struck cannot be considered to be of any great value.

SUMMARY.

As a Cure for Sheep Blow-fly.—Dressing kills maggots on struck area.

As a Preventive for Sheep Blow-fly.—Of no marked benefit. Does not entirely prevent reinfestation.

Toxicity.—None observed.

Effect on Wool.—No injurious effects noted.

Effect on Wound.—Somewhat irritant, and retards healing. Causes fissures, which are resorts for fly and hard to cleanse.

Ease of Application.—Easy to apply; penetrative.

Persistence.—Not observed.

General Conclusions.

1. *Value of the Dressings tested as Preventives of Attack by Sheep Blow-fly.*—No dressing can be said to have consistently given good results. Certain dressings appeared at times to afford a protective action of short duration. No dressing on any occasion protected for any considerable period when blow-flies were numerous, nor did any dressing ever show any marked benefit over an extended period.

2. *Value as a Cure for Sheep Blow-fly Attacks.*—Judged by the disappearance of the maggots from the wounds all the dressings were stated to be of value. It would appear that some were of greater value than others, inasmuch as reference is made to the failure of certain dressings to dislodge maggots where there was much "harbour," or where the skin was broken. Reinfestation of dressed wounds is said to have occurred with some of the dressings.

3. *Toxicity.*—None of the dressings were found to be dangerous to the general health of the sheep.

4. *Effect on the Wool.*—Injurious effects in the way of staining, bleaching, or "rotting" of the wool were noted with some of the dressings.

5. *Effect on Wound.*—Three of the dressings are said to have been unduly irritating. One was of distinct value in promoting healing. Another possessed no irritant action.

6. *Ease of Application.*—With the exception of one, which on account of its liquid consistency was wasteful, all were satisfactory in this respect.

7. *Persistence.*—The observations made were insufficient to afford any useful information.

In summary, it can be said that no dressing was found consistently to be satisfactory in all respects.

Though numerous tests have been undertaken it must be borne in mind that in many of them the incidence of the fly was not sufficiently great for a satisfactory conclusion to be drawn. The number of trials that proved to be really tests of the value of the preparations is, therefore, only a fraction of the total. Nevertheless, except in the case of Dressing F, there were sufficient effective tests to warrant the general conclusion expressed in the preceding paragraph.

Calcium Cyanide Dust for Fumigation of Citrus.

EXPERIMENTS TO DETERMINE DOSAGES.

J. M. ARTHUR, Orchardist, and T. H. HARRISON, B.Sc., Agr., Lecturer in Botany and Entomology, Hawkesbury Agricultural College.

THE use of calcium cyanide dust as a source of hydrocyanic acid gas for fumigation purposes was first brought under the notice of orchardists in New South Wales by Professor H. J. Quayle, of California, who in a series of tests on the Murrumbidgee Irrigation Areas in March, 1923, demonstrated that the use of this dust offered an efficient substitute for the sodium cyanide-sulphuric acid method. A summary of the report then submitted was published in the *Agricultural Gazette,* December, 1923.

Experiments conducted by the Department at Lisarow and Gosford in 1924 indicated that calcium cyanide could be used successfully under conditions of relatively high humidity, and also that the dosages used by Professor Quayle could be considerably reduced. In fact, as a result of tests at Gosford, indications were obtained that an excellent kill of red scale (*Chrysomphalus aurantii*) and white wax (*Ceroplastes ceriferus*) could be obtained when only a 25 per cent. dosage, as read from the Owl chart, was given. Further tests carried out by the Assistant Fruit Expert at Dubbo in February, 1925, led him to conclude that "the dose recommended by Professor Quayle can be reduced very considerably."

It was then arranged that the present authors should carry out some experiments on the orchard of Mr. H. E. Ewins at Kurrajong. Conversations with Messrs. Arnold and Ewins revealed the fact that local growers had already fumigated several hundreds of mandarin and orange trees by the calcium cyanide dust method, and as a result of their experience had formed the opinion that by reading "ounces calcium cyanide dust" for "ounces sodium cyanide," the "Allen No. 2 Fumigation Chart" could be used with safety.

In the light of the accumulated evidence it was decided to treat two trees with the full modified Owl dosage (being reading x 1·5), two trees with 50 per cent. dosage, two with 25 per cent., two with 12½ per cent., and two with 6¼ per cent. dosage. The trees were measured by both the Owl and the Allen methods, and an interesting comparison of the various recommended dosages is contained in the accompanying table.

A block of Valencia orange trees was selected for the purpose, and the treatment took place on the night of 18th March, 1925, between the hours of 6 p.m. and 8.30 p.m. The night was fairly clear, with some passing cloud and breezes occasionally. The temperature (wet and dry bulb readings)

was taken on the outside of the tent at the time of the commencement of the fumigation period. Bell tents were used, and the dust was blown under the tent with a rotary blower.

TABLE showing Doses for Various Trees under Various Scales.

Tree No.	Size of Tree. On Allen Method. Height.	Size of Tree. On Allen Method. Diameter.	Size of Tree. On Owl Method. Over.	Size of Tree. On Owl Method. Round.	Dosage. Allen No. 2 Table.	Dosage. Owl Chart.	Dosage. Recommended (Owl x 1·5).	Dosage. Actual Application.	Temperature. Dry Bulb.	Temperature. Wet Bulb.	Humidity.	Condition of Tree when Treated.
	ft. in.	ft. in.	ft. in.	ft. in.	oz.	oz.	oz.	oz.	Fah. deg.	Fah. deg.	Per cent.	
1	5 0	6 0	13 0	15 0	1	3	4·5	4·5	71	64	66	Tree in fair order, scale heavy.
2	5 6	6 6	15 0	18 0	1½	4	6	6	71	64	66	Tree in very low condition, apparently dying, losing leaves, and scale heavy.
3	5 0	5 0	13 6	17 6	1	4	6	3	71	64	66	Tree in very good condition, scale fairly heavy.
4	5 0	6 0	12 6	18 0	1	4	6	3	73	64	59	Tree only in fair condition, scale heavy, leaves falling.
5	6 0	6 0	14 6	18 0	1	4	6	1½	74	65	59	Tree very scaly, heavy leaf fall, though tree looks green and fairly healthy.
6	5 0	6 0	14 0	14 0	1	3	4½	1⅛	74	65	59	Scale exceptionally heavy, tree in very bad condition.
7	5 0	6 0	14 0	17 6	1	4	6	¾	75	68	68	Tree fairly vigorous, very scaly, but no leaf fall.
8	6 0	7 0	16 0	16 0	1	4	6	¾	74	68	72	Tree healthy and fairly vigorous, scale fairly heavy.
9	5 0	6 0	12 6	17 0	1	4	6	⅜	69	62	65	Tree healthy, with fair quantity of scale present.
10	8 0	5 0	20 6	15 0	1	4½	6¾	7/16 app.	67	62	74	Tree in good condition, healthy and fairly vigorous, scale heavy.

A careful examination was made of the trees on 30th March, 1925, when the following observations were recorded:—

Trees 1 and 2.—Very heavy leaf drop in both cases. Red scale all killed on No. 1. One fruit on outside edge of tree No. 2 showing living scale. Otherwise scale all dead.

Trees 3 and 4.—Leaf drop heavier than desirable. Slight burning of a few young shoots. All scale and wax killed.

Trees 5 and 6.—Leaf fall not excessive, less than expected in tree No. 6. All scale and wax killed on leaves and twigs, but a few isolated live scale still on two fruits on outside of tree No. 5. One moving red scale noticed on tree No. 6, probably bark infection.

Trees 7 and 8.—Leaf fall slight to moderate; absolute kill of scale on leaves and twigs of both as well as fruit on No. 8. One fruit on outside of tree No. 7 showed a few live scales.

Trees 9 and 10.—Leaf fall only slight; probably normal drop of functionless leaves. On both trees scale killed absolute on leaves and twigs, but on fruit about 0·5 per cent. of scales still alive.

The trees were again examined on 18th May, 1925, when the following observations were recorded:—

Trees 1 and 2.—Trees now pushing forth new shoots, although leaf fall very heavy. No sign of scale now.

Trees 3 and 4.—Trees now cleaned up nicely; the scales practically all sloughed off.

Trees 5 and 6.—Trees recovering well, cleaning up nicely. Tree No. 5 still shows red scale on several fruits on outside of tree, while No. 6 shows other moving scales with ladybirds at work.

Trees 7 and 8.—Trees both now in excellent condition, clean and vigorously healthy. The fruit which showed living scale before, still present on tree No. 7 Scales all sloughing off elsewhere.

Trees 9 and 10.—Trees in very healthy condition; most of the scale now fallen from twigs and leaves. Living scale present as noted at previous observation.

Conclusions.

It will be seen from the table that dosages showing a range from 37½ per cent. to nearly 500 per cent. of the quantities specified in the "Allen No. 2 Chart," and a range from 6¼ per cent. to 100 per cent of dosages recommended in the "Owl Chart," but multiplied by 1·5, were given, with results that must be considered entirely satisfactory.

This shows very clearly that fumigation by the dusting system is attended by far less risk of failure and of damage to the tree than by the use of sodium cyanide and sulphuric acid, as it is very well known by orchardists that care must be taken to give the correct dosage when fumigating by the old method.

It is considered that these tests, backed up as they are by the practical experience of growers on the Kurrajong Soldiers' Settlement, who have now fumigated over 12,000 citrus trees, show definitely that when using calcium cyanide dust for fumigating citrus trees it is quite safe to follow the "Allen No. 2 Chart," substituting ounces of dust for ounces of sodium cyanide. Moreover, the indications are that even this dose is in excess of actual requirements. We are of opinion that further experimental work will most likely show the economically efficient dose to be 50 to 75 per cent. of the dose as read in the "Allen No. 2 Chart."

We are indebted to Messrs. Ewins and W. S. Arnold for assistance given.

A Problem that Awaits Solution.

One or two further remarks we may make.

In California (the home of citrus fumigation) the doses given are considerably higher than those found effective in New South Wales; *e.g.*, the standard dose in California is 1 ounce sodium or potassium cyanide or 20 cc's liquid hydrocyanic acid per 100 cubic feet of space, whereas in the "Allen No. 2 Chart" the dose is approximately only 1 oz. to 175 cubic feet of space. Accepting the dictum of Knight in "Hilgardia," vol. 1,

No. 3, May, 1925, that when using calcium cyanide dust, "to get mean concentrations similar to those produced by liquid HCN, a dosage of nearly 150 per cent. is required," it is seen that approximately 1 oz. calcium cyanide dust would be required for each 66 cubic feet of space.

It would appear that the above calculations have been based on the assumption that the atmospheric moisture is responsible for the evolution of hydrocyanic acid according to the general equation—

$$Ca\,(CN)_2 + H_2O = CaO + {}_2HCN.$$

When it is realised that the commercial dust only contains approximately 50 per cent. pure calcium cyanide, it can be seen that on paper the dosage of calcium cyanide dust should be one and a half times that of potassium or sodium cyanide. Even this does not explain the figures in the Owl Chart, much less the Quayle dosage; *e.g.*, tree No. 5 in the table has an approximate cubic content of 153 cubic feet, and hence on the above argument would be given in California approximately 2 1-3 oz. dust. The Owl Chart reads 4 oz. for this tree, and the Quayle dosage 6 oz. Inasmuch as experience has now definitely shown that the dose of this size tree under our conditions should not exceed 1 oz., it would seem that there must be other factors governing the evolution of hydrocyanic acid from calcium cyanide dust.

Is a Blower Essential?

The question whether a blower is necessary to the application of calcium cyanide dust is of importance to citrus growers at the present time, the cost of the blower being one of the drawbacks to the new method. An endeavour has been made by means of special machines to distribute the dust uniformly throughout the tent, but it does not seem necessary. In California, for instance, the dust is purposely blown evenly on to the ground by means of small dusting bellows.

An experiment designed to test this point was carried out at the College on 28th April, 1925, the calcium cyanide dust being simply thrown through the foliage of the trees by means of a small sugar scoop. Four trees were treated, one with 100 per cent. dose according to the "Allen No. 2 Chart," one with 75 per cent., and two with 50 per cent. dosages. All the trees were badly affected by red scale and were fumigated at sundown. In every instance an excellent kill was obtained, as observations at various periods failed to reveal any living scale. In January, 1926, the four treated trees were green, healthy, and scale-free.

Somewhat of an Experimenter.

THE successful fruitgrower of the future must recognise the needs of his trees in their ever shifting process of readjustments and adjust his cultural practices accordingly. He must be somewhat of an experimenter, at least to the extent of finding out exactly the conditions under which he is conducting his business.—*Better Fruit.*

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat :—

Canberra	Manager, Experiment Farm, Condobolin
	Chaffey Bros., Nemingha House, Tamworth.
	J. Watson, Merriwagga.
	E. J. Johnson, "Iona," Wongalia, via Parkes.
	T. R. Jones. "Birdwood," Forbes.
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
	W. W. Watson, "Woodbine," Tichborne.
	W. G Law, "Wattle Park," Armatree.
	A. Millgate, Back Trundle Road, Parkes.
	Hobson Bros, Cunningar.
Clarendon	L. Jarvis, "Ferndale," Gilgandra.
	Manager, Experiment Farm, Glen Innes.
	E. J. Johnson, "Iona," Wongalia, via Parkes.
	A. Millgate, Back Trundle Road, Parkes.
Cleveland	W. Burns, "Goongirwarrie," Carcoar.
	Manager, Experiment Farm, Bathurst.
Currawa	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
	Hobson Bros., Cunningar.
	L. J. Death, Pinedale, Carrol.
Federation	A. Millgate, Back Trundle Road, Parkes.
	H. J. Harvey, "Kindalin," Dubbo.
	W. W. Watson, "Woodbine," Tichborne.
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
	T. R. Jones, "Birdwood," Forbes.
Firbank	Manager, Experiment Farm, Condobolin.
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
Florence	Manager. Experiment Farm, Glen Innes
	H. J. Harvey, "Kindalin," Dubbo.
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington
Gresley	Manager, Experiment Farm, Condobolin.
	W. W. Watson "Woodbine," Tichborne.
	W. G. Law, "Wattle Park," Armatree.
Hard Federation	Hobson Bros., Cunningar
Improved Steinwedel	Hobson Bros. Cunningar.
Marshall's No. 3	W. G. Law, "Wattle Park," Armatree.
Onas	E. J. Johnson, "Iona," Wongalia. via Parkes.
Rymer	Chaffey Bros, Nemingha House, Tamworth.
Wandilla	Manager, Experiment Farm, Temora.
Waratah	Hobson Bros., Cunningar.

Wheat (continued) :—	
Yandilla King	H. J. Harvey, "Kindalin," Dubbo.
	W. W. Watson, "Woodbine," Tichborne.
	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
	A. Millgate, Back Trundle Road, Parkes.
	T. R. Jones, "Birdwood," Forbes.
Oats :—	
Algerian	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Glen Innes.
	C Bennett, Forbes-road, Cowra.
	J Lyne, Farm 1636, Yenda.
Guyra	Manager, Experiment Farm, Glen Innes
Mulga	Manager, Experiment Farm, Condobolin.
	C. Bennett, Forbes-road, Cowra.
Reid	J. A. Reynolds, Ben Lomond.
White Tartarian	Manager, Experiment Farm, Glen Innes.
Grasses :—	
Hooker's Fescue	Manager, Experiment Farm, Glen Innes.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

TUBERCLE-FREE HERDS.

THE following herds of cattle have been submitted to the tuberculin test by Government veterinary officers or approved veterinary surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd :—

Owner	Address.	Breed.	Number tested.	Expiry date of this certification.
Department of Education	Hurlstone Park Agricultural High School	......	47	23 Nov., 1926.
Do do ...	Yanco Agricultural High School.	......	29	14 Jan., 1927.
Do do ...	Fastwood Home ...	......	10	7 Oct., 1926.
Do do ..	May Villa Homes ...	......	6	8 Jan., 1927.

—MAX HENRY, Chief Veterinary Surgeon.

JUST A MATTER OF EQUILIBRIUM.

WHEN man steps in to control the normal functionings of living forms (animals and plants alike) to his own benefit, the equilibrium is disturbed and a readjustment must take place. Thus, when we cultivate our orchards and prune and fertilise the trees certain results are obtained which are merely the responses and efforts of those trees to re-establish the equilibrium we disturb. The conditions under which these readjustments take place and the factors involved are intricate and interwoven. The problem is a gigantic one and must be subdivided into numerous smaller ones. —*Better Fruit.*

Poultry Notes.

March.

JAMES HADLINGTON, Poultry Expert.

The most important considerations at the present time should be plans for the forthcoming breeding season. Any new stock to be introduced to the farm should be arranged for during March and April with a view to having the breeding pens made up by 1st May, particularly where pullets and cockerels are concerned.

This, perhaps, raises the question of the inadvisability of breeding from birds in their first year. The old fallacy has been many times combated in these notes, but for the benefit of new readers it is worth re-stating. The facts are that, if pullets and cockerels are not fit to breed from when ten months old and onward, they should not be used as breeders at any time. The reason why so many farmers cling to the notion that they must have second-year birds to breed from is because late-hatched or poorly-developed specimens are so often used.

This, of course, is not deprecating the use of second-year birds as breeders. On any farm these will be used to a greater or lesser extent, according to circumstances, and sometimes almost exclusively. Even third or fourth-year birds might form part of the breeding stock, for no definite rule can be laid down on this matter. Frequently birds of an advanced age are bred from solely because of their good qualities, and the class of progeny they have produced. All these are matters for determination in the light of experience and of the circumstances of the case.

One thing, however, is vital to any farm, and that is a good proportion of early chickens each year. Without this, a farm is weakened in proportion to the lateness of the young stock. It is folly to aim only at August and September chickens, unless one is to be for ever relying on day-old chickens for the carrying on of the farm. If one is ever to have even a moderately reliable strain of birds, he can only have it by continuous breeding of his own birds.

To ensure early chickens one must not rely solely upon aged or even second-year hens, which often do not lay many eggs until July or even August. In order, then, to secure early chickens most reliance should be placed on well-developed pullets, which are usually laying when eggs are required for early setting. True, most of the June and July, and often early August-hatched White Leghorn pullets will break into a partial moult during the summer or early autumn, but they are the more desirable as breeders on this account, having laid, moulted, and in consequence become more mature. Even these pullets will mostly lay a month earlier than their mothers. Cockerels, too, are more reliable than second-year birds during the winter months, although this applies more to heavy breeds than to light.

Size as a Factor in the Breeding Pen.

This, then, is the case for age. Size is the next consideration. Very few poultry-farmers will be found to-day who prefer small birds. The lesson has been learnt that there is nothing incompatible with fair size, according to the breed and productiveness, and as regards size of egg it is not possible to maintain it long without good physical development. Small birds will inevitably mean undersized eggs. What this means will best be gauged by the difference in price of first and second grade eggs.

But to return to the size of birds. It is a very noticeable circumstance that there is a lack of preception on the part of many poultry-farmers as to what constitutes desirable size, and, hence, when visiting farms it is frequently necessary to call attention to some diminutive specimens in the breeding pens. The flocks, even on the best run farms, are sure to contain many birds below size and quality, but in the breeding pens one expects to find selected specimens above the average in both respects.

The following are desirable weights in breeding stock:—

Orpingtons, Langshans, Plymouth Rocks, or Rhode Island Red cockerels should weigh 7 to 8 lb.; pullets, 5 to 6 lb. Cocks in their second year 8 to 9 lb., hens 6 to 7 lb.

Leghorn cockerels should weigh 5 to 6 lb; pullets, 4 to 4½ lb.

Cocks should go at least 6 to 7 lb., and hens 4½ to 5 lb.

These weights should not be a matter of guess work, but scales should be brought into use in the running of a farm very much more than is at present the case.

How to Detect the Non-layers.

In the course of visits to farms recently, and while poultry food has been so high in price, it has appeared to me as almost inexplicable to find so many poultry-farmers, who are dependent on their birds for a living, who are yet so backward in their knowledge of selection. It is not too much to say that thousands of laying hens have been marketed, while thousands that were "off the lay" and due by age and condition to go out have been retained on the farms. Why this should be the case is difficult to understand, seeing that the subject has been so often dealt with in these notes in the simplest possible terms, and that there is scarcely a district where demonstrations have not been held and the matter explained.

The difficulty is that poultry-farmers think that they are too busy to attend day demonstrations, and, since it is only in daylight that such demonstrations can be given effectively, many miss opportunities of learning how to cull their birds. Night lectures are good in their way, but the farmer will do well to get his information on culling by daylight. The loss of time will be well repaid.

It may be stated at once that the poultry-farmer who expects to be able to make one or two cullings of old hens do for the whole summer is certain to be losing money. The right thing to do is to make weekly or bi-weekly cullings of all hens over two years old, and even some the first year; though among the latter it should be confined principally to poor weedy specimens, while among the former the decision to retain them should be

based only on their being required as breeders or on the fact that they are still laying. The main consideration, from an economic point of view, should be laying capacity.

It is not sufficient at this time of the year to sum up the position of a flock of aged hens in the fact that it is laying so many eggs, and is therefore up to the average of expectations for that month. Once it has been determined to dispose of a portion of the flock, culling out those which fall out as layers should be commenced and persisted in each week until the flock is disposed of. By this means the same number of eggs will be gathered daily from a smaller number of hens.

The way to recognise the laying hen from the hen that has ceased to lay has been given in these notes previously, but in view of the fact that there are many farmers still unable to distinguish between them the information may be repeated.

It is possible for the experienced eye to run over a flock of hens and very closely to approximate the daily number of eggs being laid, and to pick out the hens that are not actually laying from those that are—and this only by the condition of the hens! Many of those that are not laying can be recognised at once by the shrunken condition of the comb, wattles, face, and eyes. There will be others in which these features are less pronounced and which are in a stage of going off or coming on—at this time of the year mostly the former.

But one can get a still closer estimate by handling the birds. The guide in this case is the pelvic bones. If the pelvis is closed to, say, 1 inch or less, and the bones have become rigid and hard instead of wide apart and pliable, it is an indication that the hen has ceased to lay or to develop oscytes; in which case she will be off laying for some considerable time. If, on the other hand, the bones are neither wide nor closed, but are a medium width apart, it is an indication that the state of laying, while it might be suspended, is not yet a decided factor. If the pelvic bones are sufficiently wide to admit of the free passage of an egg, and they are supple so that they can become relaxed, it is a sign that the hen is in laying condition.

These two bones are situate one on either side of the vent, slightly above it, and, as a rule, they are only just covered by skin. Of course there are finer points of judgment, which can only come as a matter of experience. The idea that the measure of a hen's capacity as a layer can be determined by the distance between the pelvic bones should not be entertained seriously, although there is some tendency in that direction. The writer has handled hundreds of hens in which these features would have led to wrong conclusions, but expansion and contraction are a fairly reliable guide to the subject under discussion—that is, whether a bird is laying or not laying. A little practice should make anyone with ordinary intelligence sufficiently proficient to cull the actual non-layers from the layers.

The Poultry Farmer in a Heat Wave.

During last month several heat waves of a character that was fairly frequent some fifteen to twenty years ago have been responsible for the loss

of many thousands of hens. Naturally the blow has fallen heaviest on farmers who have not had previous experience of heat waves of such intensity. The character of the summer as late as January was not at all indicative of the weather conditions which have been experienced during February; hence it did not seem necessary to repeat former warnings. In these notes for January, 1923, some advice was given in respect of treatment of birds during heat waves, which may, in general, be repeated here.

In these visitations the novice poultry-farmer is generally caught unawares, and pays dearly for his experience in the loss of a large number of birds that might have been saved by taking proper precautions.

When the thermometer registers a shade temperature of over 102 it is time to look round the pens with a view to finding any hens that are being overcome by the heat, and by the debilitating effect of drinking so much warm water, particularly on top of mash food. With the promise of an extraordinary hot day it is often advisable to feed a light feed of grain in place of the morning mash.

Nothing but constant attention in looking round the yards, in the houses, and wherever the birds congregate, will minimise loss. The poultry farmer must be prepared to face the heat himself, and at the price of great vigilance to hunt out the affected birds. If caught in time before they are too far gone, dipping the birds in a bath of water, or holding them carefully with the head and neck free under water from a tap for a couple of minutes, and then placing them in the coolest shade, will save most of the cases. Usually the worst hours are between 1 o'clock and sundown.

Young stock under six months old, if kept under good conditions, rarely suffer from the effects of the heat in such a way as to cause many deaths. Still they should not be neglected in case they crowd together into the houses.

Observations during the recent heat waves have shown that some mistakes are being made. For instance, while it is a good practice to hose, or otherwise put water on the ground in shady, draughty places where the birds congregate, it is a mistake to do the same thing in the roosting houses. It can only result in increasing the humidity, and thereby may do more harm than good, particularly where the houses are not well ventilated.

Another precaution is necessary—that is to see that the drinking water is shaded, and arranged so that the birds have not far to travel to get at it.

It is also advisable to feed very lightly during heat waves.

The Effect of Clean Milk Competitions.

In the course of a recent wireless talk on clean milk, the secretary of the Yorkshire (Eng.) Agricultural Society made special reference to the beneficial effect of clean milk competitions. One of the most striking and satisfactory features was the keen interest taken by the workers in the new methods. In the last local contest no fewer than half the competitors had marketed their milk at prices ranging from 4d. to 8d. per gallon above the prices current in the district.

Orchard Notes.

MARCH.

W. J. ALLEN and W. LE GAY BRERETON.

THE picking, grading, and packing of pome fruits were fully dealt with in last month's issue, though the picking season of these fruits extends until early May. The caution in last month's Notes that fruit for curing by drying must be fully ripe might be reiterated. Currants, sultanas, and White Muscats or Gordo Blancos should be allowed to hang for a week to a fortnight after they are sweet enough to eat before being picked for drying. If they are dried before they have reached their full maturity and a high sugar content, there will be an excessive loss of weight and the dried product will be inferior and not plump, fleshy, and full flavoured. In districts where these fruits are grown without irrigation, the berries on some bunches will often start to shrivel before the remainder are ripe enough for drying. In such cases it is a good plan to make a first picking of bunches which show this shrivel.

During recent years the cold dip for sultanas and lexias has been revived, and though perhaps investigations have not yet reached finality it is worth while each one testing out the cold dip on a portion of his crop, and thus being guided, not only by official investigations, but also by his own experience.

Prunes ripen so unevenly that it is impossible to pick them from the tree and to avoid getting some under-ripe fruit. To obtain an even sample it is necessary to allow them to drop and to gather them regularly from the ground. To facilitate picking up, the soil around the trees should be rolled or smoothed by some means.

Full directions for harvesting and curing prunes, currants, sultanas, and lexias can be obtained free in leaflet form from the Department; also a bulletin on "Fruit Drying," which includes the curing of the above fruits, as well as peaches, apricots, apples, pears, and figs; price 10d., post free.

Cover Crops.

As a general rule it is better to sow cover crops during February, but as in many places the weather has been so unfavourable for germination they will probably not be in advance upon a crop sown during the present month. The upkeep of humus in orchard soils is of great importance, but the ploughing in of cover crops must be done with great caution or more harm than good may be occasioned.

In our inland parts, where the rainfall is only just sufficient for the healthy growth of the tree and production of fruit, it is only during an abnormally wet year that a cover crop can be grown. As it is impossible to forecast with certainty how the season is going to continue, some risk

is involved even in a wet year. In districts of much higher rainfalls the risk is less, of course, as one has only to fear the exception when the rainfall is short. Where water is available for irrigation this danger is eliminated, though it must not be forgotten that the cover crop (whether it be a sown crop or a crop of weeds) is competing with the trees, and extra water must be allowed accordingly.

Some Rules Regarding Cover Cropping.

Sow early in order to obtain as much growth as possible before ploughing time in the winter. Use a leguminous crop, if possible; avoid straw crops amongst trees.

Make sure of having the cover crop all ploughed under by the middle of July, regardless of whether it has reached its full growth or not.

If it is allowed to remain longer and the season turns dry, the trees and coming crop may suffer from loss of moisture. Even where this risk can be eliminated by applying water artificially it is still necessary to plough under before the end of winter, in order to give time for the cover crop to rot and render available to the trees in the spring the plant foods it contains, and which it has largely absorbed from the soil.

If a dry autumn occurs after an early sown crop has made a good start, and the citrus trees commence to show signs of distress, the cover crop should be sacrificed if water cannot be applied. Whether green manuring can be practised in an orchard or not, every opportunity should be made use of to apply any bulk organic matter to the soil, which will rot down and form humus.

If fruit-growers have not already done so, they are advised to read "Soil Fertility: Its Maintenance and Improvement by Means of Cover and Green Manure Crops" by Mr. H. Wenholz, B.Sc., the first part of which appeared in the January number of the *Agricultural Gazette*.

Cultivation.

Of course, where cover crops are sown, or where it is desired to allow a crop of weeds to develop for ploughing under, cultivation for the season is finished. But in dry districts where it is not wise to allow such crops, the ground should be ploughed as soon as possible after the fruit has been harvested from each block of trees. Such early ploughing puts the ground in condition for absorbing any rain that falls.

Preparing Land for Planting.

It is a good plan to plough (and sub-soil if necessary) any land intended for planting during the coming season. It is one of the advantages of such early preparation that the subsoil has an opportunity of becoming saturated before planting should good autumn or winter rains fall.

Planting Citrus.

If land intended for planting is in good condition, citrus trees can be planted during the early part of this month, and even later on the northern parts of the coast. Where there is any danger of winter frosts such trees

should be protected by bushes or other covering. This protection should be repeated each winter for the first three or four seasons. If dry weather continues, the young trees should be watched and watered when necessary.

Insect Pests.

Codlin Moth.—During the busy time of the fruit season, one is liable to neglect control measures for this pest, but regular inspection of bandages should be continued until it is quite certain the grubs have ceased going into crysalis and then into moth form for the season.

The bandages should be left on during the winter, as grubs will be found to take shelter in them even after the trees are cleared of fruit. The regular destruction by boiling or burning of all infected fruit is an important adjunct to other methods of control, and should be continued until the entire orchard is cleared of fruit.

It is very gratifying to find that bandaging has been tried with very satisfactory results by several growers in one of the western apple and pear districts, and that the adoption of this accessory method of control was due to a visit of a grower of another western district. It is to be hoped that the practice will go on and that it will spread through all our pome fruit districts.

Citrus Scale.—Provided the trees are not suffering too much from dry weather, March is quite a good time to carry out destruction of citrus scale by fumigation. A report on the fumigation tests with calcium cyanide carried out by Messrs. Arthur and Harrison of Hawkesbury Agricultural College, appears elsewhere in this issue, and anyone intending to use calcium cyanide in place of potassium cyanide will find it a useful guide.

For Maximum Production from Maize.

Three of the main essentials in the growing of maize are early ploughing, rotation, and fertilising. When I say early ploughing I mean ploughing in autumn and early winter, and allowing your land to fallow. The early ploughing is far preferable to the spring ploughing. I have found the yields from early ploughing to be greater by from 10 to 12 bushels per acre. As to rotation, I find that the growing of field peas every second year and ploughing in very profitably increases the yield. Broom millet prior to a crop of maize also tends to increase the yield. In my early days of maize-growing I regarded fertilising as a waste of money on my rich soil, but I now fertilise the whole of my maize crops, and in my opinion there is no land too rich to respond to a little fertiliser. I usually apply one bag of superphosphate to the acre, and occasionally a top-dressing of about 1 cwt. of nitrate of soda to the acre. This year in the maize competition I have scattered along the drill well-seasoned cowyard manure at the rate of 5 tons to the acre as well as the top-dressing of nitrate of soda, and by the present appearance of the crop I will be handsomely repaid for my labours.—J. P. Mooney, at Dorrigo Agricultural Bureau Conference.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society.	Secretary.		Date.
Batlow A. Society	C. S. Gregory	Mar.	16, 17
Blayney A. and P. Association	H. R. Woolley	,,	16, 17
Armidale and New England P. and A. Association	A H. McArthur	,,	16 to 19
Cumnock P. A. and H. Association	K. J. Abernethy	,,	17
Gundagai P. and A. Society	M. W. Holman	,,	17, 18
Macleay A. H. and I. Association (Kempsey)	N. W. Cameron	,,	17, 18, 19
Camden A. H. and I. Society	G. O. Sidman	,,	18, 19, 20
Goulburn A. and P. Association	....	,,	18, 19, 20
Rydal A. H and P. Society	V. Bruce Prior	,,	19, 20
Stroud A. and P. Association	....	,,	19, 20
Tamworth P. and A. Association	H. G. Read	,,	23, 24, 25
Cooma P. and A. Association	C. J. Walmsley	,,	24, 25
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	,,	24, 25, 26
Warringah Shire and Manly (Brookvale Park)	T. Murray	,,	27
Royal Agricultural Society	G. C. Somerville	,,	29 to Ap. 7
Liverpool A. and P.	....	April	9, 10
Gloucester A. H. and P. Association	L. J. Fox	,,	14, 15
Narrabri A. and P. Association	....	,,	14, 15
Bathurst A. and P. Association	....	,,	14, 15, 16
Orange A. and P. Association	G. L. Williams	,,	20, 21, 22
Upper Manning A. and H. Association (Wingham)	C. Stewart	,,	21, 22
Clarence P. and A. Society (Grafton)	L. C. Lawson	,,	21 to 24
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,,	22, 23, 24
Wellington P. A. and H. Society	A. F. Rotton	,,	27, 28
Lower Clarence A. Society (Maclean)	T. B Notley	,,	28, 29
Dungog A. and H. Association	W. H. Green	,,	28, 29, 30
Hawkesbury A. and P. Association	....	,,	29 to May 1
Dubbo P. A. and H. Association	F. Weston	May	4, 5
Richmond River A. H. and P. Society (Casino)	....	,,	5, 6, 7
Coonamble P. and A. Association	....	,,	12, 13
Kyogle P. A. and H. Society	L. Campbell	,,	12, 13
Trangie P. A. and H. Association	A. K. Butter	,,	20, 21
Bonalbo A. and I. Society	W. G. E. Johnston	,,	27, 28
Murrumbidgee P. and A. Association	F. H. Croaker	Aug.	24, 25, 26
Cootamundra P. A. H. and I. Association	W. W. Brunton	,,	31, Sept 1
Grenfell P. A. H. and I. Association	T. Weneham	,,	31, ,, 1
Young P. A. H. and I. Association	T. A. Tester	Sept.	7, 8, 9
Gunnedah P. A. and H. Association	M. C. Tweedie	,,	7, 8, 9
Lake Cargelligo P. A. H. and I. Association	J Costella	,,	8
Ganmain A. and P. Association	C. C. Henderson	,,	14, 15
West Wyalong P. A. H. and I Association	T. A. Smith	,,	14, 15
Cowra P. A. H. and I. Association	E. Todhunter	,,	14, 15
Melbourne Royal	....	,,	16 to 25
Murrumburrah P. A. H. and I. Association	W. Worner	,,	21, 22
Canowindra P. A. H. and I. Association	J. Rhue	,,	21, 22
Temora P. A H. and I. Association	A D. Ness	,,	21, 22; 23
Boorowa P A. H. and I. Association	W. Thompson	,,	22, 23
Barellan P. A. H. and I. Association	J. Doherty	,,	29
Barmedman P. A, H. and I. Association	W. Pemberthy	,,	29
Hillston P. A. H. and I. Association	J. Pevers	Oct.	1
Ardlethan P. A. H. and I. Association	R. L. Neill	,,	6
Narrandera P. and A. Association	W. H. Canton	,,	12, 13
Ariah Park P. A. H. and I. Association	J. McInness	,,	13
Griffith P. A. H. and I. Association	M. E. Sellin	,,	19, 20

VOL. XXXVII. PART 4. APRIL 1, 1926.

Agricultural Gazette of New South Wales.

Wheat-growing in the Trundle District.

GEORGE BERRY, "Woodview," West Trundle.*

As evidence of the steady improvement in the methods of wheat-growing practised in this State, nothing is more convincing than the westward movement of the limits of the wheat belt in the past twenty years. Improved cultural methods and varieties, the use of fertilisers and the association of sheep with the production of wheat, have all had their part in this extension of the wheat areas, and in the improved yields now obtained as compared with those of the past.

The movement has been as definite and as interesting in the Trundle district, I think, as any other part, and a summary of the factors that have influenced the development of wheat-growing in that part of the central west is interesting as being representative of a good many other parts.

The western limits of the wheat belt in New South Wales were first determined in 1904, when a map showing a "wheat experience line" was prepared by the Government Statistician. On that map the line actually passed through Trundle, so that at that time Trundle was regarded as on the extreme western limit for payable wheat-growing.

When the wheat experience line was drawn in 1912, it was shown to have shifted a few miles to the west of Trundle, and when the third line was drawn in 1922 (as published in the *Agricultural Gazette* in January, 1924) we find that the line had again moved westward, and Trundle—once on the very limits of the wheat belt—is now 20 miles or so inside it.

Looking back over the records of the area under wheat each year, it is apparent that there was a marked expansion about the years 1904 and 1905, though the actual figures are not easily procurable. In 1908 the area cropped for wheat in what is called the "Trundle police patrol" was 12,876 acres. In that year the yield was set down as 38,862 bushels, which does not look a very encouraging return. In 1909, however, the area jumped to 20,609 acres, and the yield reached 245,554 bushels or nearly twelve bushels per acre. The area then remained practically stationary till 1913, in which year it moved up to 26,065 acres with an average of nearly 15 bushels per acre. Encouraged by this, the areas ranged round 40,000 acres for some years, but more recently there has been a rapid increase, the area for the 1923 harvest being put down by the Statistician at 56,659 acres. Notwithstanding that the yield that year was not good, the area in 1924 for the Trundle police patrol increased to 71,030 acres, from which an average of 18 bushels per acre was obtained. Provisional estimates for the harvest just over put the area at 67,268 acres and anticipate an average of about 14½ bushels per acre.

* Paper read at the Agricultural Bureau Conference at Dubbo on 3rd March, 1926.

It will be gathered that, together with a remarkable increase in the area in the Trundle district in the past twenty years, there has been an improvement in the average yields, a circumstance of which the Trundle growers may justly be proud.

The average rainfall as recorded at Trundle over thirty-seven years is 17·89 inches, of which 10·61 inches fall within the growing period (April to October).

Quite as interesting has been the development of wheat-growing in the western side of the Trundle district. Twenty years ago or more it was thought that the richer, heavier soils on the eastern side of Trundle would always suit wheat better than the lighter soils on the western side, but since then there has been a steady expansion of wheat-growing to the west of Trundle. The story of that development could, perhaps, hardly be better told than by relating the history of wheat-growing on the properties of the firm of W. Berry and Sons, Limited, of which my father (now resident in Sydney) is the chairman, and I am the manager. This family company owns three properties (of which "Woodview" is the largest), totalling 12,240 acres of freehold and conditional purchase, together with other grazing leases. A further property of 2,560 acres freehold, "Old Byong," is held by myself. In the past season we stripped 3,400 acres on the properties owned by the family, harvesting 21,200 bags, or six and a quarter bags per acre. In addition 1,700 acres were harvested on "Old Byong" for about 9,500 bags, or about five and a half bags per acre, the aggregate being 5,100 acres and 30,700 bags of wheat.

Early Days at "Woodview."

For the first wheat grown on "Woodview" we have to go back to about 1890 when 7 acres were planted. The ground was worked up with a single-furrow plough, and a home-made harrow made from kurrajong timber. The seed was broadcasted, and a scythe was used to open up the edges of the crop and to cut the tracks for the binder. Good hay crops were generally harvested in those early days, but encouraging returns in grain were also sometimes obtained, and we soon increased the area and procured a stripper and winnower. The crop of 1894 was a good one, and it was carted 40 miles to Parkes in the winter of 1895 by contract at 1s. per 4-bushel bag. The price was a poor one, however, only 1s. 8d. per bushel. In 1895 500 acres were sown, but the result was poor. We continued to increase, sowing about 700 acres in 1897 and getting a six-bag average. In 1898 1,100 acres were put in, a spring-tooth cultivator with grain box attached being used for sowing, and three strippers and a tread power winnower being used to harvest the 10-bushel crop. Up till 1905 we continued to sow 1,000 to 1,200 acres yearly, and in 1905 1,500 acres were put in. However, the crops were not too profitable, and after that year the area was reduced and for a time we practically ceased wheat-growing.

I am satisfied now that had we in those days put more work into the preparation of the ground, and also used superphosphate, it would not have been necessary to stop cropping. Very little fallowing was done at that time, of course, and even when the land was ploughed early it was left alone, and no trouble was taken to work the surface. It is quite apparent now what were the errors of those early days, and why wheat-growing was not attractive enough for us to continue.

However, small areas were still put in each year on "Woodview," and about 1914 we started properly again. In 1915 our total exceeded 2,000 acres—a figure below which we have never got since. For the last ten years we have averaged about 2,800 acres, rather over half of which has always been on fallow, and the balance on "ex-fallow."

Some Recent Yields.

In 1920 our average was 22 bushels. In 1921 it was 21 bushels (after 1,500 tons of the best stuff had been cut for hay at an average of 35 cwt. per acre). The years 1922 (12 bushels) and 1923 (5 bushels) were not so good, but in 1924 we had an average of 19 bushels over the whole place and 24 bushels on the fallow land, with a good deal of crop down.

For the past season 2,100 acres of fallow were sown on the firm's properties, the balance being on ex-fallow. In addition to the 3,400 acres stripped for wheat, 200 acres were cut for hay and 100 acres were under oats. The foregoing figures are only quoted in order to illustrate the steady increase in the area devoted to wheat west of Trundle, while the averages quoted go to show positively that West Trundle is safe wheat country.

The Practice of Fallowing.

It will be gathered that I regard fallowing as essential to success in this country, and certainly our returns justify such a conclusion. Summarising our experience it may be said that we have had in the last ten years an easy 20-bushel average from an area of about 1,500 acres of fallow land. In view of the coming season over 3,000 acres have been fallowed on "Woodview."

Speaking generally it is not necessary to fallow every year. The practice of one fallow and two crops is generally satisfactory. For the fallow we plough 4 inches deep, and if it was possible to turn the soil completely over with a 3-inch ploughing that is what I would do. However, the sod must be turned well under and 4 inches seems necessary to do that. I do not care for the "cultivator fallow" as a thorough ploughing is necessary. We like to start the fallowing by June and to finish not later than the end of August, though that is not always possible.

In September or October the spring-tooth cultivator is put over the land, and if rain comes in the summer the surface is worked again, commencing

as soon as harvest work is completed. At the first working with the spring-tooth cultivator the points are put down to the bottom of the furrow, and the later workings are shallower.

The Use of Sheep.

Sheep are, of course, run on the fallow. In fact, the proper use of sheep is one of the main things in successful wheat-growing. They are the cheapest way of keeping the fallow clean. On "Woodview" and the other properties they are on the fallow the whole time from first ploughing till sowing. They are also grazed on the stubble—after the horses have been through it. Merinos and comebacks seem to suit our conditions best. We tried crossbreds some years ago, but after the year 1920 when the prices for crossbred wool were so poor, we went back to Merinos. The wool gets a bit dusty, of course, with the grazing on cultivation, but that is far more than covered by their value in connection with the wheat, for they keep the land remarkably clean, and in any case the return for wool last year averaged 15s. per sheep. We stock wheaten and oaten hay as a fodder reserve for the sheep, and are satisfied that it is necessary to have some feed on hand. One farmer in this district has erected a small galvanised iron silo in which to store oats for his sheep, and the cost was only 6d. per bushel capacty on the first year, which meant cheap storage.

Sowing "Ex-fallow" Land.

I believe in a good burn of the stubble. We have had experience of the burn being missed, and know its value. It cleans the ground of weed seeds and diseases, and gives clean crops afterwards. With a good burn and the ground lightly worked up at once I would almost as soon take my chance for a good crop on ex-fallow land as with a clean fallow. At the same time one would not say it is always safe to sow ex-fallow land. The seasonal conditions and the condition of the land must govern. I do not consider it necessary to plough ex-fallow land. All that is required is to work up the seed-bed again with the spring-tooth cultivator. No doubt this was one of our troubles years ago. We regarded it as necessary always to plough for a sowing, but we are learning how to work the land better now.

Occasionally it is well to spell the land in addition to the fallow year. It cleans the land up and adds to the humus in the soil. Such a system fits in well with a greater use of oats on western farms. I purpose going in more for oats, as they help to clean the paddocks, and if sown and cut early for silage or hay they help to control barley grass. About 500 or 600 acres sown with oats would supply a lot of grazing during the winter, and should the season be favourable, the stock could be removed and the crop allowed to run up for silage, hay, or grain. Oats are a most useful reserve fodder and are better than any other grain if it is necessary to hand feed. In addition to the cleaning of the land from weeds, oats afford a useful change from wheat, and allow time for wheat diseases to die out.

The methods outlined, have kept our paddocks particularly free from wild oats.

Manuring.

The use of superphosphate has been another factor in the improvement of our yields compared with twenty to thirty years ago. West Trundle lands are undoubtedly suited by that fertiliser. Years ago East Trundle farmers were getting good crops while we were getting light ones. Often they got six to seven bags while we got only 6 to 7 bushels, but to-day we are getting pretty much the same as them, thanks largely to the use of superphosphate. Even if the season should be a bad one, we are assured of a couple of bags per acre, and even that pays when the feed for the sheep is taken into account. With cultivation we are able to carry more sheep on the properties than we could when we were only grazing.

Superphosphate is used on every acre. For the early sowing 45 lb. is enough, but the amount should be increased as the sowing season advances, and we used up to 60 lb. of "high-grade" last year, averaging about 50 lb. No doubt heavy dressings of superphosphate on the early sowings tend to make too much growth, and it is wise, therefore, to start with somewhat lighter amounts. Any excessive growth in the early crops can be fed off.

What We Sow.

Federation is easily the best of all varieties for our purposes. We have been growing our own seed for twenty years, occasionally purchasing stud seed from the experiment farms. College Purple and Canberra have also done well with us (the latter not quite so well as the former), and we have also tried Gresley, Gluyas Early, Waratah and Florence, but still put Federation at the top.

We have always "bluestoned" the seed, and regard it as so important that the operation be properly carried out, that my brother or I have always carried it out personally. It is never left to the men—not even to men who have been on the place for years. We have not tried copper carbonate, but will, no doubt, have to do so. However, our results with bluestone have been so good that there is no ball smut on the place. We grade all seed and store it in a mice-proof enclosure, and we know exactly how much seed is laid out for every paddock, carting to the men in the field as required.

Our rate of sowing recently has certainly been heavier than formerly, and I would favour an increase rather than any decrease. At one time 30 to 35 lb. seed per acre was the rule, but, everyone in this part of the State is now using more. I would advise starting with Federation toward the end of March at 45 to 50 lb. of seed per acre, and rather increasing the amount toward the end of the sowing. On the average our best crops are from early-sown crops.

Labour Conditions.

All the work on the properties is done by piece-work. I consider it the most profitable system, and especially on such a large scale. We provide the plant and the horse feed, and the men tucker themselves, accommodation being found where desired and stores being available on the place.

The rates paid for the various operations are as follows:—

	s.	d.	
Ploughing with 6-furrow plough	3	0	per acre.
,, 5 furrow ,, ...	3	6	,,
,, 14-disc sundercut	2	0	,,
12 ft. implements (springtooth cultivators, drill or combine)...	1	0	,,
8 ft. header harvester	3	0	,,
12 ft. ,, ...	2	6	,,

In the case of the harvesters, the scale is a sliding one, so that the men are compensated for handling an extra heavy crop.

All these operations are paid subject to "satisfactory completion," 75 per cent. being paid as progress payments, and the balance held. Full settlement is made three times a year, viz., on completion of harvesting, completion of sowing, and completion of fallowing. On this basis the men do very well, ploughmen making £5 to £6 per week, and some of the harvesting hands in the past season reaching £12 and £14 per week. This system is found a much better one than day-labour, the men working well and being more careful that every operation is properly performed. We covered nearly 400 acres per machine in the harvest just completed, which is far better than paying £1 per day and perhaps covering only 250 acres per machine.

The cost for labour of putting in and taking off a crop can be gathered from the above figures. Our ground last year produced a bit over £4 10s. in the paddock. Against that has to be put the labour charges quoted above, the maintenance of a cropping and harvesting plant which is roughly worth £6,000, also 45 to 50 lb. seed wheat per acre, 45 to 60 lb. superphosphate, bags, rent of land, and so forth.

On 12th January, 1926, the whole of the crop (30,700 bags, less seed wheat) had been harvested, and all but one waggon of wheat had been carted to the railway. About a third to half of the crop is carted by ourselves and the balance by contract.

The Plant Required.

It may be interesting to state that the plant consists of nine headers, four reapers and binders, four drills, two combine drills, three 35-tine cultivators, three 18-feet harrows, five 5- and 6-furrow ploughs, two 14-disc sundercuts, pulley chains to hook seventy-six horses, 100 draught horses, collars, &c., fire-fighting plant, two 2-horse lorries, one 1-ton motor truck, three waggons of 10 to 16 tons capacity.

The sheep on "Woodview" and the associated properties number 8,000, and for these an eight-stand shearing shed, concrete dip, and yards, and covered shed with drafting yards (also sheltered) are provided. These latter appointments are also used by neighbours on terms that seem to be satisfactory to them. The aggregate gross income for the two years 1924 and 1925 exceeded £51,000.

What Land Values Suggest.

It will be gathered that we have no intention of retiring from wheat-farming now. Rather, our intention is to increase our area, and we hope to see the year when we will market 50,000 bags. Meantime, we recall the time twenty-five years ago when land in Trundle district was only worth 10s. to 20s. per acre. We ourselves bought land on the Condobolin road at 15s. per acre, c.p. and c.l., for which we would hardly take £4 to-day, and there is no cultivation on it. "Woodview" itself (7 miles west from Trundle) is worth £6 per acre at least, and sales of land within 10 miles of Trundle have taken place at prices ranging from £4 10s. to £6 on a freehold basis. One farmer recently bought a neighbour out at £6 per acre.

In view of all this, we can regard Trundle as a thoroughly safe wheat district, and can feel that we have to-day sound methods of farming for the conditions, and that the wheat experience line may in a few years be pushed still further westward.

"CATTLE BREEDING."

THIS handsome volume of 500 pages records the proceedings of the Scottish Cattle Breeding Conference held at Edinburgh in July, 1924, where delegates from the oversea Dominions, the United States, and several European countries took part. The papers read were, many of them, of the greatest value, embodying the most recent knowledge available upon many aspects of cattle breeding. As Sir Robert Greig, Chairman of the Board of Agriculture for Scotland, remarks in a brief foreword, "This book will appeal chiefly to the scientific worker and to the expert breeder, but it should be found useful for years to teachers and students as a text-book upon the subject of breeding."

The quotation of the titles of a few of the papers will give some idea of the scope of the subjects covered:—"The Origin of Cattle," "The History of Stockbreeding and the Formation of Breeds," "Inheritance in Cattle," "The Inheritance of Milk and Beef Characters," "The Reproductive Functions in the Cow," "Cattle Breeding Problems," "'Family' Breeding and Line Breeding," "Character Correlations, Live-stock Judging and Selection for Type," "Breed, Show, and Market Standards."

These occur in the portion of the volume devoted to scientific aspects of cattle-breeding, but several papers are collected in Part II which discuss cattle-breeding investigations in various countries, and in Part III a further group of papers reviews cattle-breeding in various countries under such titles as "Shorthorn Breeding in America," "The Milking Shorthorn of Australia" (by Mr. J. T. Cole), and so forth.

The book has rare claims upon the attention of a specialised industry.

Published by Oliver and Boyd, Edinburgh.

" . . . the *Agricultural Gazette,* which publication is getting more interesting and useful to the man on the land every year."—A Beecroft farmer.

Four Advantages from Fallowing.

The benefits of fallowing have been frequently and variously summed up. Following are four advantages stressed by Mr. H. J. Harvey, "Kindalin," Dubbo, at the Western District Conference of the Agricultural Bureau held at Dubbo last month:—

1. The land is kept clean, and the market value of the farm is increased by at least £2 per acre.

2. A fallowed paddock often provides in a wet season a place where ewes and lambs can be kept away from grass seeds in the spring. In 1921 (a very bad spring for seed) a 200-acre paddock of fallow kept our flock of 600 sheep in fair condition till the seed fell, and probably saved the lives of a hundred or more.

3. The farm work is spread over the greater part of the year, and by having the seed-bed well prepared the full advantage of early rains can be utilised.

4. Finally, by sowing a smaller area and getting a bigger return, the harvesting plant can be reduced, which means other economies of seed, superphosphate and wages, greater profit to the farmer and prosperity for the district.

Discussion of this and other particular aspects of wheat-growing (each subject being introduced by some well-known grower of the district) constituted a feature of this highly successful conference.

The Age of a Rooster.

"Kindly enlighten me as to how to tell the age of a rooster. I have a Black Orpington bird, aged 14 months; he has scales on his legs and spurs about an inch or so long. His sale was cancelled on account of his age, as the would-be buyer said he was 3 years old. I asked: 'How do you know?' and he said: 'Oh, look at the scales on his legs and the long spurs.' The bird is only 14 months old. I have had him from a chicken."

The writer of the foregoing was informed that there is no way of determining the age of a bird after he is 14 months old, or for that matter once it is in old feather. Length of spur and appearance will enable one with experience to make a judgment on age. Even length of spur is deceptive. As far as legs are concerned, scaley legs will make a young bird look aged.—J. Hadlington, Poultry Expert.

Infectious Diseases Reported in February.

The following outbreaks of the more important infectious diseases were reported during the month of February, 1926.

Anthrax	Nil.
Pleuro-pneumonia contagiosa	4
Piroplasmosis (tick fever)	Nil.
Swine Fever	Nil.
Blackleg	3

—Max Henry, Chief Veterinary Surgeon

Field Experiments with Wheat and Oats.

CONDOBOLIN EXERIMENT FARM.

Summary of Results, 1924-25.

F. MATTHEWS, H.D.A., Experimentalist. Condobolin Experiment Farm.

ALTHOUGH the harvest just completed is but the second of these experiments, and it is as yet hard to state definitely what varieties of wheat and oats will be best adapted for the production of hay and grain on the western plains area of which Condobolin is representative, it was thought that a *resumé* of the trials at this stage may be of interest to farmers generally.

It must be borne in mind that the results under review are those of two years in which the rainfall has just exceeded the average. In 1924, after a dry autumn, exceptional spring and summer rains were experienced, which encouraged the spread of the foot-rot fungus (*Helminthosporium sativum*), and also badly bleached the grain, while in 1925, although good falls were obtained in the early winter, the spring and summer rains were of no consequence. The fact that some of the varieties of wheat yielded up to 2 tons 13 cwt. of hay per acre, and up to 25 bushels of grain, strengthens the theory that with a properly worked fallow, the farmer in these districts need not depend to the same extent as in the past on the rainfall during growth.

The Condobolin District.

A few particulars concerning the class of soil, farming conditions, etc., may not be amiss before entering into a general discussion of the actual tests.

Condobolin, situated 338 miles from Sydney, on the Lachlan, is in the centre of the western plains division, and is now practically the extreme edge of the wheat belt. Crops are being grown further west than Condobolin, but most of them would be classified in the local police patrol district.

The average rainfall is 17·07 inches, the bulk of which falls in the months of May, June, and July, while the summer rains, although fairly substantial, come in thunderstorms in varying months. Located as the district is—midway between monsoonal and antarctic disturbances—the necessity for the conservation of moisture in the fallow is apparent, as often one or the other will fail.

The country is slightly undulating, the bulk of the wheat land being of granitic origin, that on the slopes generally overlying the parent rock and that on the plains being of drift formation. A percentage of the plain country is very deep, but in most of it the clay subsoil can be located at a depth of 9 inches.

Provided fodder crops are grown and silage is conserved, the district is well adapted to mixed farming, and it is noteworthy that there are severa landowners in the district who have realised the practical value of the Department's recommendations with regard to the conservation of fodder. The Merino, of course, is used for the production of wool, the climate being too severe and the locality too far from market for the crossbred. The main crops at present are wheat and oats, while the possibilities of Sudan grass and lucerne for grazing have yet to be tested. The growing season for cereals is rather short compared with most districts, harvesting generally being completed about the first week in December. On an average a dry harvest may be expected, although occasional thunderstorms are experienced.

As yet the district is essentially a grazing one, but the area under wheat is steadily increasing. Last year 29,548 acres were sown. Land values compared with other centres, are low—close to railway facilities up to £3 10s. per acre, and further removed as low as £1 10s. per acre.

The practice of sowing wheat continuously should not be considered in the farming system of the district: (1) owing to the uncertainty of the rainfall during the growing crop period; (2) because of the danger of the spread of disease and the black oat menace; (3) because of the reduction of the humus content.

Planting.

The growing season being short, and generally speaking the rainfall falling off to practically nil in the spring months, it is essential that only varieties capable of maturing fairly early be grown. Contrary to expectations, it is not, however, the earliest maturers that appear most suited. Varieties such as Sunset, Early Bird, Clarendon, and Firbank, while looking promising in the early spring, have in both years of trial fallen away at the ripening stage, and only grain of a light, pinched nature has been harvested. It would appear that late frosts were a factor to be considered in the relatively light yields of these varieties.

The sowing period therefore is not of long duration, commencing early in April and being completed early in May. Sowing oats first enables them to be harvested before the wheat is ready, with considerably less risk from storms than if they were sown later.

The Experiments.

The area of the plots has been one-thirtieth acre, each variety being sown in triplicate, thus considerably obviating variation in yield due to soil irregu larity.

The hay trials were cut with the binder a littl. after flowering stage, and the produce from each plot weighed when ready to stack. The grain trials were stripped, cleaned with the blower, and the produce weighed.

Up to the present the cropping system on the Farm has been merely wheat alternated with fallow, and as yet yields have been maintained. There are however, indications that the system is commencing to tell on the soil texture, due to the loss of humus, and it is evident that before long a rotation embodying the growing of a fodder crop will have to be commenced.

With this end in view, a trial over an area of 50 acres will be commenced this year to test the benefits of a three-course rotation as compared with the wheat and bare fallow at present in vogue. At present the land is ploughed with the disc to a depth of 6 inches as soon as practicable after harvest, grazed with sheep whenever the fallow shows green, sundercut 3 to 4 inches in early spring, and if possible spring-toothed twice prior to sowing. This treatment, however, is resulting in a surface mulch inclined to run together, and a reversion to the mouldboard plough with after cultivations with a rigid tine cultivator is being considered.

Disease is not plentiful in the district, climatic conditions being against its spread. Flag Smut (*Urocystis tritici*) is perhaps the worst, particularly in wheats of Federation parentage. Foot-rot (*Helminthosporium sativum*) resulted in slightly diminished yields in 1924, but the time has not yet come when it is advisable to burn instead of turning under the straw.

A point worthy of note is that superphosphate was used at the rate of 75 lb. per acre for the grain, and up to 90 lb. per acre for the hay trials, with no deleterious effects. Provided the land is well worked fallow, thereby enabling the crop to be grown with at least 20 inches of rain, in most years no fears need be held with regard to burning off.

Experiments to obtain more accurate data as regards increased applications of superphosphate in conjunction with increased rates of seeding are being conducted over a period of years. While definite information in regard to the rate of seeding is not yet available for grain, experience to date shows that from 50 to 60 lb. per acre should be used. Larger sowings are likely to result in pinched grain.

The following table shows the rainfall for the two years under review.

Month.	1924.	1925.	Month.	1925	
	points.	points.		points.	points.
January	200	50	August	290	85
February	210	165	September ...	193	28
March	98	0	October	80	31
April	15	115	November	514	255
May	355	63	December	60	92
June	301	168			
July	140	135	Total	1,773	1,810

The Grain Trials (Wheat).

The following table shows the yield per acre each year, and the average yield for the two years :—

GRAIN TRIALS. (WHEAT).

Variety.	1924.		1925.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.
Rajah	32	0	19	10	25	35
Ranee	28	18	21	30	24	48
Gresley	26	36	20	0	23	18
Billy Hughes	27	18	19	15	23	16
Hard Federation	27	30	18	50	23	10
Canberra	26	10	19	45	22	56
Union	29	0	16	30	22	45
Waratah	25	0	19	35	22	17
Bald Early	21	10	22	30	21	50
Ghurka	24	18	18	35	21	26
Newman's Early	22	36	20	10	21	23
Riverina	24	0	16	40	20	20
Clarendon	23	54	14	50	19	22
Binya	20	18	18	10	19	14
Florence	23	0	14	40	18	50
Firbank	18	36	13	40	16	8

Sunset gave a yield of 13 bushels 10 lb. per acre and was eliminated, after the first year of trial, and Duri, 20 bushels 25 lb. per acre, Hurst's No. 9, 15 bushels 45 lb., and Early Bird, 11 bushels 10 lb. per acre, were tried for the first time in 1925.

Notes on Varieties for Grain.

Ranee (Indian F x Federation).—A promising introduction from Victoria. Grain in weak flour class and inclined to crack slightly. Stands dry spells well, and not affected to any extent by frost. Matures a few days later than Hard Federation.

Rajah (Indian E x Telford).—Another Victorian introduction that appears suited to local conditions. It is a drooping, club-headed variety; chaff white and pubescent, with grain in weak flour class.

Gresley.—A West Australian wheat, which is at present the standard dual-purpose wheat on the farm. The grain in both seasons of trial has been plump and of good colour; being held fairly tightly in the awn, it will stand a fair amount of rain at harvest time without bleaching.

Billy Hughes.—An earlier selection from Hard Federation that has been grown here for a number of years. Grain resembles that of Hard Federation, does not crack to any extent, and will be fairly plump even in a bad year.

Bald Early.—A Victorian selection from Improved Steinwedel, which may prove a useful dual-purpose variety for the district. The grain is plump, and has not that tendency to shell which was the drawback to Steinwedel.

Ghurka (Yandilla King x Zaff).—An excellent variety in a dry year. The yield cannot be taken as accurate, as it is very hard to thrash, and with the stripper a considerable quantity of the grain is lost in unthrashed heads. Better results would be obtained if a header could be used, as the heads would then continue to pass through the drum until thrashed.

Hay Trials (Wheat).

The following table shows the results of the hay trials in two sections—early and mid-season sowing—with the varieties in order of yield :—

WHEAT VARIETY TRIALS FOR HAY.

Variety.	1924.				1925.				Average.			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Early Sown.—												
Gresley ...	2	16	0	27	2	7	0	6	2	11	2	16
Bald Early	2	8	1	0	2	7	3	12	2	8	0	6
Boonoo ...	2	10	1	22	2	2	2	10	2	7	0	2
Florence	2	5	1	8	2	5	2	4	2	5	2	4
Firbank	1	19	0	8	2	6	3	24	2	3	0	2
Yandilla King...	2	18	2	27	....				....			
Wandilla	2	14	3	0	....				....			
Improved Steinwedel...	2	0	2	27	....				....			
Steinwedel x Ghurka 58CI	....				2	8	1	26	....			
Clarendon	....				2	1	3	16	....			
Mid-season Sown.—												
Boonoo ...	2	18	2	3	2	8	1	2	2	13	1	16
Gresley ...	2	12	1	0	2	13	1	6	2	12	3	3
Bald Early	2	17	2	6	2	7	3	5	2	12	2	19
Florence	2	12	0	15	2	12	1	8	2	12	0	25
Clarendon	2	9	0	2	2	10	2	24	2	9	3	3
Firbank	2	3	2	9	2	6	0	11	2	4	3	10
Waratah	....				2	11	3	4	....			
Steinwedel x Ghurka 58CI	....				2	9	2	26	....			
Baroota Wonder	....				2	7	2	10	....			

Notes on Varieties for Hay.

Yandilla King and Wandilla were eliminated after the first year of trial, as being too long seasoned for the district. They yielded well when tried, but the spring was an exceptionally wet one. Improved Steinwedel was eliminated because wheats of somewhat similar breeding with better straw yielded better.

Boonoo (Steinwedel x Yandilla King x Zaff).—This variety and the other selection from the same cross, 58CI, appear suited to hay production in the district, but cannot be regarded as good yielders for grain. They are brown chaffed, tip awned, slightly pubescent, and although holding the grain fairly well, bleach badly.

Waratah (Purple straw x Gluyas).—Performed very creditably in trial for first year. Should, however, be sown in first sowings, as it is one of the longest seasoned wheats on trial. Promises to be a fair dual-purpose variety for most years.

Oat Trials.

The following table gives the yields of both grain and hay for each year and the average yield:—

Oat Variety Trials.

Variety.	1924.	1925.	Average.
Grain.—	bus. lb.	bus. lb.	bus. lb.
Lachlan	43 20	37 30	40 25
Mulga	39 3	38 8	38 25
Sunrise...	37 30	30 13	32 18
Buddah	31 36	32 18	32 7
Algerian	55 10	....	....
Yarran	40 20	....	....
Fulghum	....	39 5	....
Gidgee	....	38 30	....
Belar	....	36 20	....
Hay.—	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Lachlan	3 7 3 8	2 14 1 12	3 2 0 20
Mulga	2 17 1 23	3 0 1 12	2 18 3 18
Sunrise	2 13 3 17	3 2 2 0	2 18 0 23
Buddah	2 9 1 19	2 15 1 22	2 12 1 10
Yarran	3 8 1 26	....	....
Algerian	3 1 0 18	....	....
Fulghum	....	3 0 2 24	....
Belar	....	2 19 0 3	....
Gidgee	....	2 15 8 11	....

Notes on Oat Varieties.

Lachlan (White Ligowo x Algerian).—An excellent dual-purpose oat for the district. Matures a plump, dark-brown grain about a week later than Sunrise. Stands a dry pinch well, but requires a fair spring rain to yield its best.

Yarran.—Similar breeding to Lachlan; was eliminated after first year's trial, as the Lachlan appeared slightly the better yielder.

Algerian.—Being too long seasoned for most years was eliminated after first year of trial.

Mulga.—Best dual-purpose oat grown. Matures about a week before Sunrise; although the grain may not be quite equal to that of Lachlan, still the hay is of much superior quality.

Fulghum.—American oat tried for first time in 1925. Heavy yielder of both hay and grain, but straw appears weak.

Belar.—Appears to be good dual-purpose oat. Matures a week later than Sunrise. Plump light coloured grain; straw should stand a fair amount of rain before lodging.

Farmers' Experiment Plots.

Wheat and Oat Variety Trials, 1925.

Western District (Dubbo Centre).

B. M. ARTHUR, H.D.A., Agricultural Instructor.

The following farmers co-operated with the Department in conducting cereal experiments during 1925:—

S. Reilly, junr., Eurimbla, via Cumnock.
Quirk and Everett, "Narrawa," Wellington.
W. J. Matchett, "Wychitella," Toongi, via Dubbo.
H. Harvey, "Kindallin," Rawsonville, Dubbo.
Barry O'Neill, Narromine.
J. Parslow, "Kelvin Grove," Gilgandra.
W. G. Law, "Wattle Park." Armatree.
A. H. Newton, "Yarrandale," Armatree.
L. C. J. Broughton, "Berrima," Mendooran.
H. B. Loveband, "Blenheim," Coonabarabran.
Corderoy Bros., "Pilton," Purlewaugh.
E. Ferguson, "Hill Crest," Coonabarabran.
R. Johns, "Ulewallen," Baradine.
S. Holt, "Wyberba," Baradine.

Comparable results were not obtainable at Mendooran, owing to new ground being in too loose a condition; at Mr. E. Ferguson's, where manurial and rate-of-seeding trials were spoilt by the ravages of cockatoos; nor at Mr. S. Holt's, owing to barley grass getting the upper hand on land which had not been fallowed.

The Season.

The past year has been one of many surprises. It has treated some localities more than favourably, while others have reason to complain on account of total or partial crop failures. Heavy rains during November. 1924, saturated fallows, and in some places inundated them or caused excessive erosion. Unfortunately the majority of farmers were not able to take full advantage of these heavy rains and work their ground owing to harvesting operations clashing; consequently the soil became caked and hardened, much soil moisture was lost, and weed growth (particularly paddy-melons) was prolific, and got the upper hand. Further beneficial rains early in the new year enabled cultivation to be proceeded with, but in many cases either the disc plough or disc cultivators had to be used to deal effectively with the excessive weed growth (to chop up and bury the paddy-melons, &c.), thus tending to upset the consolidation of the soil, and to make the surface soil too fine. March and April were very dry, and many farmers who had delayed their soil preparation were caught napping, and were unable to do anything on account of the hardness of the soil. May saw the advent of good soaking rains, however, aggregating over 2 inches, the first good fall recorded in that month since 1921. This enabled those who were prepared to go ahead with their seeding operations, but ploughing was

frequently interrupted by rain during May, June, and July, and many failed to reach anywhere near their original planting objective. Thus there was a considerable falling off in the total area under crop. A considerable area was also sown as late as August, with little chance of success in view of the subsequent seasonal conditions.

Early-sown crops germinated well, and made good early growth, but much of the June and July-sown areas, put in between falls of rain, were water-logged, causing the seed to swell, burst, and rot.

During June the Narromine district received falls aggregating from 7 to 10 inches, and as a large percentage of the Narromine country consists of excellent free-working soil, the soil was well soaked without being water-logged, and this stood to the crops on fallow and stubble land alike through a particularly dry spring, producing many record crops, and an average of probably not less than eighteen bushels for the district, which is hardly likely to be exceeded in the State for the 1925 season.

Turvey Wheat at Mr. B. O'Neill's, Narromine. Yield, 46 bus. 12 lb. per acre.

Dubbo Wellington, and Cumnock districts also received good winter rains, but the soil conditions are different to those at Narromine, and many areas under wheat became too wet, with consequent ill effects on the crop, though fair to good yields were obtained. As one proceeded northwards, however, the June rains were much lighter, which had a very considerable effect on the yields, as throughout the whole of the western district the months of September and October, just when a saving rain was required, were extremely dry. Consequently crops in the Gilgandra and Gulargambone districts were poor, averaging not more than nine bushels. Those on fallowed land stood out prominently against the failures or partial failures.

Further north at Mendooran, Dunedoo, Leadville, Coonabarabran, and Baradine the position was worse, largely owing to the lightness of the winter rains, and also perhaps to the less effective preparation of the seed-bed in many cases. November saw the advent of good soaking rains, but they were too late to be of any material benefit except in isolated cases in the slower-growing districts on the Slopes. It is pleasing to record that these

rains did not occasion any material damage to the matured crops as was the case in 1924, and the general sample of grain, though perhaps slightly pinched, had excellent colour and went well above f.a.q. standard.

RAINFALL Records.

Locality.	May.	June.	July.	August.	September.	October.	November.	Total for growing period.	On Fallow.
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
Eurimbla	243	546	222	139	28	93	222	1,473	1,900
Wellington	285	258	134	176	44	101	...	998	2,177
Dubbo (H. Harvey)..	282	435	155	85	30	48	...	1,035	2,602
Dubbo (W. Matchett)	...	595	154	275	16	62	480	1,383	...
Narromine	245	728	174	80	76	100	...	1,403	1,848
Gilgandra	280	287	110	151	24	42	...	894	1,689
Amatree (W. Law) ...	...	183	118	80	15	130	...	526	2,137
Armatree (A. Newton).	41	209	132	231	16	130	...	759	2,082
Coonabarabran ...	...	134	162	147	65	41	288	837	1,555
Baradine	...	104	153	131	56	53	...	497	...

Cultural Details.

Eurimbla.—Red clay loam, limestone formation; previous crop, wheat and oat variety trials, 1923, manured with 56 lb. superphosphate. Mouldboard-ploughed 5 inches deep early in September, spring-toothed October and again in November, but ground set hard by heavy November rains; spring-toothed both ways late April and sown in a dry seed-bed 4th and 5th May, using 55 lb. graded copper carbonate treated seed and 60 lb. superphosphate per acre. Germination good, and results very satisfactory in view of the dry spring.

Wellington.—Red gravelly loam, probably of ironstone origin, and containing large proportion of ferric oxides. Previous crop wheat, 1923, no manure. Mouldboard-ploughed August, 1924, 4 inches deep, spring-toothed October, grazed by sheep to December, disced mid-January, harrowed early February and again mid-March, spring-toothed late April and sown 6th and 7th May with 55 lb. graded seed and 56 lb. basic superphosphate per acre. Germination and growth were excellent and crops dense, promising record yields, but a dry spring caused a certain amount of wilting and tipping, and yields, though satisfactory, were not as large as anticipated.

Dubbo (H. Hrvey).—Medium red clay loam; previous crop wheat, 1923 (no manure), failed, and fed off. Spring-toothed June, 1924, harrowed July, disc-ploughed 5 inches deep August, spring-toothed late September, harrowed October, disced October, spring-toothed late November, harrowed December, disced early February, harrowed February and again on 8th May; sown 9th and 10th May, using 57 lb. graded seed and 50 lb. superphosphate per acre. This fallow block of 100 acres was worked eleven times in all, each working being considered necessary after rain, &c., as it was not possible to use sheep owing to crops being in the same paddock. This treatment, while considered by several to be excessive, was amply

repaid, as the area averaged over 33 bushels of wheat per acre, and 59 bushels of oats per acre from 7 acres, while adjoining stubble areas returned less than a six-bag average. The growing crop was harrowed with beneficial results.

Dubbo (W. Matchett).—Medium red clay loam; previous crop wheat, 1923 (no manure). Disc-ploughed July, spring-toothed early February, again early March, disced early June; sown 9th and 10th June with combine, using 53 lb. graded seed and 60 lb. superphosphate per acre. The late sowing was followed immediately by heavy rains, and the plots, being at the lower end of the paddock, were flooded and waterlogged, resulting in thin germination and spindly growth.

Federation at Mr. O'Neill's.
Yield 41 bus. 12 lb. per acre.

Narromine.—Medium deep red loam; previous crop wheat, 1923 (no manure). Disc-ploughed July, spring-toothed January and again in April; sown 7th and 8th May, after 58 points of rain. Cross-harrowed after sowing. The soil was in good condition, and germination and stooling were excellent. The results of these plots were beyond all expectations, all varieties with the exception of Clarendon yielding over 40 bushels per acre. The oat returns were poor, more than half the grain being lost by shelling and lodging due to delay in harvesting. The Sunrise was cut for hay, as it was not possible to strip it. The accompanying photographs show the even density and height of these high-yielding plots.

Gilgandra.—Light sandy red to grey clay loam buddah land previous crop winter fodders, 1924, manured, fed off August-September. Disc-ploughed mid-September, spring-toothed early March, and again early May; sown 11th and 12th May, using a drill, with 50 lb. graded seed and 53 lb. superphosphate per acre. Germination and early growth were good, but the dry spring and frosts lessened the apparent yields considerably. The Satisfaction sown here was a Bayah by Pusa No. 4 cross, and the Perfection a cross from Currawa and Pusa No. 107, both bred by Mr. Scholz, of Gilgandra.

Armatree (W. G. Law).—Medium chocolate clay loam; previous crop wheat, 1923, manured with 45 lb. superphosphate. Mouldboard-ploughed

July and harrowed, spring-toothed mid-September, harrowed late October, disced early January, spring-toothed January also early April, and harrowed 12th May, a total of eight workings. The plots were portion of 100 acres of fallow, all of which received similar treatment; sown on 16th and 17th May with drill, using 50 lb. graded seed and 50 lb. superphosphate per acre. Germination and stooling were excellent, but a dry spring and frosts appreciably reduced the possible yields. The results from this fallow nevertheless averaged over seven bags, while the majority of the crops in the locality were largely failures. This proved another strong argument for the more frequent working of fallows when necessary.

Armatree (A. H. Newton).—Red sandy loam; previous crop, 1923 (manured). Sundercut August, 1924, disced early February, spring-toothed mid-April also mid-May, sown 19th and 20th May with drill using 55 lb. graded seed, and 52 lb. superphosphate per acre. Germination was fair, but weed growth (including couch grass, *Eragostis major*, and Shepherd's Purse) obtained the upper hand, and poor yields—especially in the late maturing varieties and oats—resulted.

Another Fine Plot at Narromine.
Riverina wheat; yield 42 bus. 58 lbs. per acre.

Coonabarabran.—Stiff grey loam with sandy patches, of poor texture. Previous crop winter fodder, 1924, manured, fed off by sheep. Disc-ploughed late November, spring-toothed mid-January and again 27th May; sown 30th May with drill using 60 lb. seed and 56 lb. superphosphate per acre. There was good moisture content at seeding time, and germination and early growth were satisfactory, but absence of rain in the spring, together with frosts, caused the crops to spindle, tip, and wilt, resulting in low yields.

Mendooran.—Red sandy loam; new ground. Cleared August, disc-ploughed early October, harrowed January, spring-toothed February and harrowed; sown 22nd and 23rd May with 60 lb. seed and 80 lb. superphosphate per acre. Harrowed after sowing. Germination was patchy, and growth uneven due to new ground and the proximity of green timber, and these influences ultimately made the plots not worth stripping.

Purlewaugh.—Medium red loam; previous crop wheat, 1923, no manure. Disc-ploughed September, spring-toothed November, again early May, and repeated 20th; sown 29th May with combine, using 60 lb. seed and 56 lb. superphosphate per acre.

Baradine (R. Johns).—Light sandy loam, red to grey in colour; old pasture paddock. Disc-ploughed August, disced February, spring-toothed mid-May; sown 1st June with 65 lb. seed and 50 lb. superphosphate per acre. Germination fair and result satisfactory, considering the small amount of rain during the growing period.

Baradine (S. Holt).—Medium red sandy loam; previous crop wheat, 1924 (no manure). Disced mid-January, sown 2nd June with disc drill. The ground was too hard, and badly infested with barley grass. Cultivation was uneven and these factors resulted in the failure of plots.

Notes on the Wheat Varieties.

Waratah (Gluyas Early x Purple Straw) has proved the most consistent yielder this season. A midseason variety, reasonably strong in the straw, and showing a fair amount of resistance to fungous diseases (particularly flag smut), it is becoming very popular in the west, and bids fair to become a rival of Canberra.

Turvey.—A slow-maturing wheat, tall-strawed with a very loosely-coupled ear; has also yielded consistently in spite of the dry spring conditions. So also has the well-known favourite, Yandilla King.

Wandilla was not so prominent this season as last, but has given satisfactory returns in most centres.

Federation still continues to give good results, and as a consistent, easily-stripped, strong, short-strawed, midseason grain wheat cannot be disregarded.

Riverina has again proved to be a good early-maturing yielder, somewhat weak in the straw, but more resistant to diseases than Canberra, which is of similar breeding.

Clarendon failed badly at all centres where tried in comparison with other varieties, and the reason for this is obscure. At Narromine, Dubbo, and Gilgandra only about half the yield of other plots was obtained, though the germination, stooling, density, and general growth were equally good. Shelling or lodging did not take place, but distinct patches of the crop appeared to ripen off prematurely, leaving the straw an unhealthy dead colour, and practically no grain in the ears. The plants were not affected by any disease known to the writer, the roots and base of the stems being in a healthy condition. Prior to this year, this variety has proved a consistent yielder under the prevailing dry conditions, particularly in the Gilgandra district.

Several wheats belonging to the farmers themselves were also tried out alongside the departmental varieties, but none of them showed any outstanding merits.

Diseases.

Fungous diseases were not present in the plots to any great extent. Bunt was again effectively controlled by the use of dry copper carbonate. Flag smut was present in a few of the plots to a greater or lesser extent, particularly in two plots of Canberra, where the amount of infection probably exceeded 20 per cent. Loose smut was also noticeable mainly in Canberra, which undoubtedly is very liable to both these diseases. Other diseases, such as take-all, footrot, rust, and *Septoria,* were negligible.

The Oat Variety Trials.

Oats for grain were tested at seven centres, using the slow Algerian variety as a basis for comparison. In every centre the newer and quicker-maturing varieties gave higher returns, although at Narromine, Gilgandra, and Armatree much grain was lost through the heavy rainstorms in November causing the plot to lodge and shell. The growing of oats for grain yields in experiment plots is an attempt to popularise the cultivation of this cereal, as a means of:—

1. Increasing the production of a commodity large quantities of which are at present brought into this State from Victoria and Tasmania.

2. Establishing a limited crop rotation in order better to control fungous diseases of the wheat plant, such as flag smut, take-all, and foot-rot, where infection is serious.

3. Providing quantities of green fodder for grazing off by lambing ewes, &c., or for storage as silage.

4. Supplying pure seed of the quicker-growing oat varieties, which have proved to give the best return under western dry-season conditions, but seed of which varieties cannot be easily obtained at present.

Pure Seed Wheat Areas.

Owing to the recent formation of several branches of the Agricultural Bureau in this part of the western district, and in order to give their members an opportunity to improve the general standard of seed sown by them, pure seed wheat areas were established for the first time, in co-operation with experiments supervision committees appointed by the respective branches. The Department supplied a bag of four varieties of wheat selected by the members of the branches as suitable to the locality, and certain farmers were selected who undertook to grow the seed on fallow, and make seed available for sale to members at the end of the second season. The branches which co-operated and the results are shown in the accompanying table.

Fertiliser Trials.

A small manurial trial with Canberra was incorporated with all the wheat variety trials. With three exceptions the manured areas gave payable increases. It was probably not the best of seasons for beneficial results from applications of superphosphate, owing to wet, cold, saturated soil conditions immediately after germination not allowing the rapid

development of the plant-rooting system which usually takes place as a result of the stimulating effect of the superphosphate; consequently, not much growth was made until the soils became drier and warmer, and the immediate benefits generally derived from superphosphates were largely lost.

In addition, tests were conducted at Wellington with basic superphosphate in place of ordinary superphosphate, negative results having been obtained from the latter in the previous year, owing, it was thought, to some soil condition creating insoluble chemical compounds, or perhaps neutralising the effect of the fertiliser. It was considered that basic superphosphate, having its own chemical base, might counteract this trouble. A further trial will be conducted next season in order to confirm the good results obtained.

Fertiliser trials were also conducted at Dubbo and Armatree with varying amounts of superphosphate, both standard and high-grade.

WHEAT Variety Trials.

Variety.	Eurimbla.	Wellington.	Dubbo. (H. Harvey.)	Dubbo. (W. Matchett.)	Narromine.	Gilgandra.	Armatree. (W. G. Law.)	Armatree. (A. H. Newton.)	Coonabarabran.	Purlewaugh.	Baradine.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus. lb.	bus. lb
Canberra	22 57	23 47	34 53	18 58	42 53	21 54	24 2	17 0	10 24	9 6	10 16
Federation	28 4	22 57	32 8	16 32	41 12	24 22	20 35	13 33	10 16	...	...
Yandilla King ...	28 1	22 19	37 39	17 37	46 52	...	16 31	3 49	12 42	..	.
Bena	24 54	23 12	34 37	16 24	43 2	22 52	19 18	10 15	...	...	.
Waratah	26 26	26 46	37 46	19 54	...	21 51	...	9 13	8 26	6 35	13 15
Wandilla	23 47	...	37 37	..	...	21 50	14 6	5 38	8 55	4 43	7 16
Riverina	...	24 4	..	...	42 58	...	23 17	18 27	7 15	...	12 2
Gresley	...	18 54	...	21 48	...	23 41	21 7	...	...	7 2	...
Turvey	...	25 51	.	.	46 12	25 5	...	7 52	...	...	..
Clarendon .. .	...	...	22 46	...	23 12	10 30	..	17 17	...	...	...
Penny	27 17	...	...	..	...	.	...	..	12 35	...	5 38
Firbank	...	..	...	...	...	...	...	...	...	...	9 36
Cleveland	...	...	..	...	...	..	...	...	14 26	...	...
Gallipoli*	...	...	...	...	...	...	...	...	...	9 2	...
Pusa, No. 4* ...	24 16	...	...	...	...	..	...	...	..	...	...
Comeback*... ...	24 7	..	...	...	.	..	...	...	...	...	..
Petatz Surprise* ...	19 49	..	.	...	...	...	...	...	...	...	..
Quality*	13 42	...	...	...	...	.	...	...	...	...	..
Satisfaction* ...	...	...	...	...	...	14 43	...	..	...	..	...
Perfection*... ...	...	...	.	...	...	11 50	...	...	...	...	...

* Farmer's own seed.

FERTILISER Trials with Canberra Wheat.

Fertiliser per Acre.	Wellington.	Dubbo (H. Harvey).	Armatree (W. G. Law).	Eurimbla.	Dubbo (W. Matchett).	Narromine.	Gilgandra.	Armatree (A. H. Newton).	Coonabarabran	Purlewaugh.
Superphosphate—	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
50 lb.	...	34 53	22 26	...	...	42 53	...	...	...	...
52 lb.	...	...	...	...	..	...	...	17 0	...	...
53 lb.	...	...	...	...	...	...	21 54	...	...	...
56 lb.	23 47	...	...	...	...	...	...	...	9 58	9 6
60 lb.	...	...	...	22 57	18 58	...	...	...	...	...
Unmanured	23 21	30 53	24 2	13 51	17 41	40 46	21 54	11 57	10 24	6 46

FERTILISER Trials with Superphosphate, High-grade Superphosphate, and Basic Superphosphate.

Fertiliser per Acre	Wellington (Federation).	Dubbo (H. Harvey) (Wandilla).	Armatree (W. G. Law), (Gresley).
	bus. lb.	bus. lb.	bus. lb.
Superphosphate—			
40 lb.	......	33 30	20 10
56 lb.	21 31	......	......
80 lb.	......	37 37	20 35
High-grade Superphosphate—40 lb.	......	......	21 7
Basic Superphosphate—56 lb.	22 28	......	......
Unmanured	20 19	33 13	19 45

OAT Variety Trials.

Variety.	Eurimbla.	Wellington.	Dubbo (H. Harvey).	Narromine.	Gilgandra.	Armatree (W. Law).	Armatree (A. Newton).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Algerian ...	42 14	29 34	57 32	20 37	11 30	14 6	...
Guyra ...	36 28	41 16	58 25	28 20	...	...	...
Belar ...	52 3	34 0	..	...	31 11	...	...
Mulga ...	30 36	..	62 20	36 0	...	...	19 2
Myall ...	...	35 16	...	...	49 14	32 27	...
Lachlan ...	...	...	57 29	...	...	...	14 2
Sunrise ...	...	...	...	...	37 21	28 12	...

PURE Seed Wheat Area.

Variety.	Purlewaugh Bureau.	Buninyong-Eulomogo Bureau.	Rawsonville Bureau.	Terramungamine Bureau	Backwater Bureau.
	bus.	bus.	bus.	bus.	bus.
Canberra	12	...	$33\frac{3}{4}$	28	28
Yandilla King	12	...	$18\frac{1}{2}$	...	*
Wandilla	5	..	...	...	...
Hard Federation	...	$18\frac{1}{2}$	...	...	...
Marshall's No. 3	...	20	..	...	...
Currawa	...	15	...	...	...
Federation	...	...	$32\frac{1}{2}$	21	36
Waratah	...	...	24	18	...
Riverina	...	...	...	...	35

* Frosted and cut for hay.

SOUTHERN DISTRICT.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

DURING 1925 the Department conducted field experiments in co-operation with the following farmers:—

J. Busch, "Naradhun," Hillston.
Carew Bros., "Selbourne," Deniliquin.
G. C. P. Circuitt, "Uabba," Lake Cargelligo.
P. Corcoran, "Weeroona," Moombooldool.
D. and J. Gagie, "Spy Hill," West Wyalong.
W. Glenn, "Maneroo," Mathoura.
Gollasch Bros., "Pine Park," Milbrulong.
G. Gow, "Hughenden," Barellan.
Hobson Bros., "Glenlea," Cunningar.
A. Jennings, "Raywood," Coolamon.
Johns Bros., "Wollongough," Ungarie.
H. T. Manning, "Ravenstone," Barellan.
M. McCrone, "Bungambil," Mirrool.
W. R. Smith, "Rosedale Park," Yuluma.
R. H. Thackeray, "Woornack," Young.
W. Thornton, "Spring Farm," Berrigan.
T. W. Turner, "Kia Ora," Lake Cargelligo.

Cultural Details.

Barellan (G. Gow).—Heavy black "crab-hole" soil (boree country), similar to the Wimmera soils. Summer-fallowed by ploughing shallow in February with a mouldboard plough; spring-toothed early in August, and ploughed again with the mouldboard to a depth of 3 inches the same month; harrowed immediately afterwards; spring-toothed February and again in May, and harrowed prior to sowing. Sheep were on the fallow throughout. It was in excellent condition at the time of sowing, having been worked with great judgment, but it should be remembered that this manner of working is only recommended for the black, self-mulching soils. Although summer fallowing is, of course, advisable in other classes of soils, the subsequent cultivation needs some modification. Sown 18th May with 60 lb. seed and 56 lb. of superphosphate per acre.

Barellan (H. T. Manning).—Soil, red loam, medium strength. Mouldboard-ploughed 4 inches deep in July, harrowed in August, spring-toothed to the full ploughing depth in September, spring-toothed 2 inches deep February, again in May, and harrowed in May. Sown 26th May with 60 lb. seed and 56 lb. superphosphate.

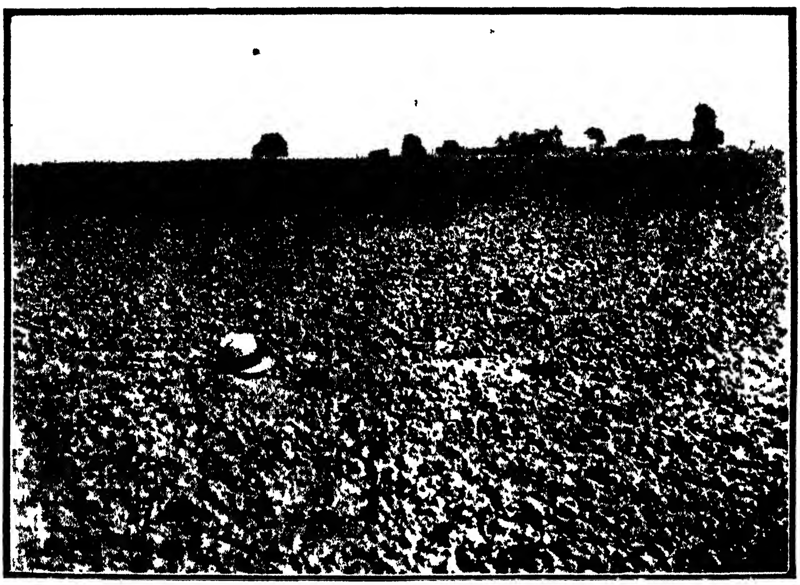
Berrigan.—Heavy chocolate loam. Mouldboard ploughed in July, disced in September and again in March; scarified with a rigid-tine scarifier in June, and springtoothed and harrowed prior to sowing. Sown 9th June with 65 lb. seed and 56 lb. superphosphate per acre.

Coolamon.—Fairly heavy red loam, typical of the better class Coolamon soils. Ploughed in July with a mouldboard plough, cultivated with a rigid-tine scarifier October, disced lightly in January, and shallow-cultivated with scarifier prior to sowing. Sown with a combine on 4th June with wheat 65 lb., oats 45 lb., and superphosphate 56 lb. per acre.

Cunningar.—Sandy loam, light brown in colour. Ploughed 5 inches deep in August, harrowed twice in October, springtoothed January and again prior to sowing. Sown 8th June, with 70 lb. seed and 84 lb. superphosphate per acre.

Hillston.—Medium red loam, light to medium in character, typical of large areas of land in this district. Mouldboard-ploughed 4 inches deep in August, spring-toothed to the full ploughing depth in October, spring-toothed lightly in January, harrowed March and again in April. Sown 21st May with 60 lb. seed and 56 lb. superphosphate per acre.

Lake Cargelligo (G. C. P. Circuit).—Plots situated 20 miles from Lake Cargelligo, down the Lachlan towards Hillston. Bright red loam, light to



Mr. W. A. Glenn's Fallow at Mathoura.

medium in character, and fairly deep; typical of thousands of acres of land in the vicinity of Lake Cargelligo, Rankin's Springs and Hillston. Ploughed June with a mouldboard plough 3½ inches deep, spring-toothed to the full ploughing depth in September, spring-toothed shallow in January and harrowed in April. This fallow was in excellent condition as regards consolidation of the subsurface soil, and the moisture content also was good considering the dry weather, but the surface was, of course, a little too fine. This country does not remain cloddy, and it is extremely difficult to maintain a cloddy surface. It has been noticed, however, that when the land has been cultivated for a few years a cloddy surface can be more easily obtained. The plots were sown on 6th May with 60 lb. seed and 56 lb. of superphosphate per acre.

Lake Cargelligo (T. W. Turner).—Dark red loam, medium strength, typical of large areas of country near Lake Cargelligo and Tullibigeal. Ploughed in July to a depth of 4 inches with a mouldboard plough; spring-toothed the full depth in October, spring-toothed shallow in November using wide tines, again in January and again in April. Sown 7th May with 60 lb. seed and 56 lb. superphosphate per acre.

Mathoura.—Strong red loam (grey box and wattle country). Summer-fallowed by spring-toothing in February, again in June; ploughed July with a mouldboard plough to a depth of 4 inches, harrowed August, spring-toothed in October, using wide points; again in November, again in January with narrow points, then in May with wide points. During May an inch of rain caused a number of black oats to grow; the fallow was skim-ploughed early in June. Sown 8th June with 58 lb. of seed and 74 lb. superphosphate. This fallow was worked nine times, inclusive of ploughing, and the results were highly gratifying. Although this is heavy country the fallow was not overworked, judging by the subsequent yields. Federation gave a yield of 19 bushels 41 lb. on a rainfall of 492 points. This is an exceptional result, considering the extremely low rainfall, and is largely due to the excellent work put into the fallow. In Victoria a yield of 3½ bushels for every inch of rain falling during the growing period is generally regarded as the maximum. The yield at Mathoura is exactly 4 bushels for each inch of rain falling on the crop. The result shows what can be done in an adverse season, marked by many crop failures. Intelligence and judgment are required to be exercised to avoid overworking these clay loams.

Milbrulong.—Red loam, medium strength. Ploughed early in July with a mouldboard plough to a depth of 4½ inches, harrowed twice in September, scarified October, again in February, harrowed in April and scarified prior to sowing. Sown 2nd June with wheat 65 lb., oats 50 lb., and superphosphate 75 lb. per acre.

Mirrool.—Medium red loam. Mouldboard-ploughed in June, spring-toothed September, scarified December, disced February, scarified April, and spring-toothed prior to sowing. Sown 6th June with 60 lb. seed and 56 lb. of superphosphate per acre.

Moombooldool.—Loose, bright red sandy soil (Mallee country). Mouldboard-ploughed in August, harrowed October, disced February, harrowed March. Sown 20th May with 63 lb. seed and 90 lb. superphosphate per acre.

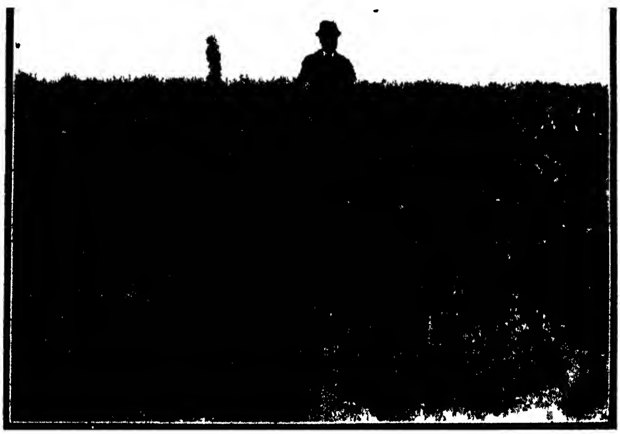
Ungarie.—Moderately heavy clay country, chocolate in colour and originally carrying boree and yarran timber. Ploughed 4 inches deep in October, spring-toothed November, again February, again in March, and again prior to sowing. Sown 19th May with 60 lb. seed and 56 lb. superphosphate per acre.

West Wyalong.—Heavy brown loam with a particularly stiff subsoil. Mouldboard-ploughed 4 inches deep in July, spring-toothed to the full ploughing depth in September, spring-toothed twice in October to a depth

of only 2½ inches, again January and again in February, and harrowed prior to sowing. Sown 20th May with 60 lb. seed and 84 lb. superphosphate per acre. Fallow in excellent condition at sowing time.

Young.—Medium red loam, mouldboard-ploughed 4½ inches deep in October, harrowed October, scarified November, again in January, again in May, and cross-harrowed prior to sowing. Sown 9th June with 65 lb. of seed and 56 lb. superphosphate per acre.

Yuluma.—Heavy red loam. Ploughed July 4 inches deep, harrowed September, spring-toothed September, again in October. Disced February, harrowed in April, and spring-toothed in May. Sown 5th May with 60 lb of seed and 56 lb. superphosphate per acre.



Waratah at Mr. G. Gow's, Barellan.

The Season.

An adverse season was experienced throughout most of the Southern district. The autumn was particularly dry. Hardly any rain fell in April, and wheat sown during this month was sown on a dry seed-bed. Rain fell in May, and the bulk of the crops were sown during this month. A few, however, were not sown until early June, which is somewhat late for this district.

Heavy rains fell at most centres during the winter months. In fact, too much rain was received in some instances, resulting in the crops being partially flooded. This was the case at Berrigan in particular.

During the spring months hardly any rain was recorded and the crops had to depend on the moisture stored in the subsoil to bring them to maturity. That such satisfactory crops were produced is a striking testimony to the up-to-date cultivation methods now coming into favour. In spite of a particularly dry autumn and spring, yields ranging up to 35 bushels were produced. Interesting information is afforded by conjointly considering the yields and rainfall for each centre. The performance at Mathoura is, of course, quite outstanding.

The most satisfactory feature of this year's results, not only on the experiment plots but throughout the district, is that medium to heavy crops were produced in spite of what must be considered an adverse season. Comparing this season's results with those of seasons similarly adverse, it seems unlikely, thanks to the attention now being devoted to the fallow, that anything in the nature of a complete crop failure will again be experienced throughout the Southern district, even in seasons of severe drought.

RAINFALL Records.

	May.	June.	July.	August.	September.	October.	November.	Total for growing period.	Rainfall on fallow.
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
Barellan (G. Gow)	536	268	142	165	52	39	54	1,256	2,100
Barellan (H. T. Manning) ...	342	255	109	159	41	69	30	1,005	2,291
Berrigan	...	268	84	90	93	8	28	571	1,940
Coolamon	...	167	169	145	77	89	109	756	2,695
Hillston	198	164	141	60	50	13	...	626	1,300
Lake Cargelligo (G. C. P. Circuitt).	254	218	147	74	12	30	...	735	1,686
Lake Cargelligo (T. W. Turner).	260	263	169	120	16	22	...	851	1,977
Mathoura	...	174	97	86	63	27	45	492	1,892
Milbrulong	...	224	153	150	80	94	133	834	1,915
Moombooldool	613	186	116	172	17	47	47	1,198	1,500
Mirrool	...	199	155	159	47	27	114	701	2,412
Ungarie	290	276	144	83	25	30	...	848	1,280
West Wyalong	342	294	145	98	64	62	...	1,005	1,720
Young	...	267	495	96	35	102	296	1,291	1,550
Yuluma	...	341	196	101	153	63	97	951	1,284

Varieties.

Federation, Waratah, and Canberra again demonstrated their suitability to the Southern district. That the results obtained on the farmers' experiment plots are substantiated on the larger areas is evidenced by the wonderful popularity of Waratah. This variety figured prominently in all the local growing crop competitions.

The Victorian variety Austan was tried at Mathoura, but gave the lowest yield of all varieties tried at this centre. Bena yielded very consistently at all centres. Judging by this season's results, this variety, while not likely to replace Waratah, Canberra, or Federation in the driest districts, such as Lake Cargelligo and Hillston, seems admirably suited to the bulk of the wheat belt in the south. Cargo also appears to be a promising variety.

Diseases.

Most of the crops this season were reasonably free from diseases, the only one noticeable to any extent being flag smut. This disease was more in evidence on the lighter country. Very little foot-rot and take-all were to be found, and rust, of course, was entirely absent.

Variety Trials.

Variety.	Barellan. (G. Gow.)	Barellan. (H. T. Manning.)	Berrigan.	Coolamon.	Cunningar.	Hillston.	Lake Cargelligo. (G. C. P. Circuitt)	Lake Cargelligo. (T. W. Turner).	Mathoura.	Milbrulong.	Mirrool.	Moombooldool.	Ungarie.	West Wyalong.	Young.	Yuluma.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Austan	...	...	...	...	...	...	...	...	12 0	...	...	...	...	...	...	...
Baroota Wonder ...	...	...	...	21 16	21 44	...	...	...	...	...	...	...	...	...	...	...
Barwang	...	...	...	21 47	...	...	...	...	...	...	...	...	...	19 30	...	...
Bena	35 17	31 10	...	24 3	25 21	21 40	22 58	22 30	17 45	18 8	20 13	...	28 57	19 50	29 29	4 2
Canberra	...	...	...	...	...	19 10	31 3	20 8	...	...	...	...	...	15 38	...	5 12
Cargo	...	...	8 3	...	...	...	...	...	...	...	22 16	...	29 45	21 21	...	...
Currawa	...	...	...	...	...	...	...	...	...	...	...	12 32	...	...	...	...
Federation	33 41	29 55	14 53	17 36	...	...	25 6	19 36	18 28	18 47	20 49	11 52	24 28	...	...	...
Gallipoli	...	...	...	...	...	...	...	...	15 50	...	...	...	...	...	...	...
Gresley	...	...	...	...	...	...	...	...	...	...	...	10 17	...	20 0	...	...
Hard Federation ...	...	...	12 3	...	...	...	...	...	...	...	...	...	...	...	...	...
Penny	...	...	...	...	26 29	...	...	...	...	...	...	12 14	...	...	...	...
Rajah	...	...	...	...	...	...	...	...	...	...	...	...	29 46	18 50	...	...
Ranee	...	...	...	...	...	...	...	...	...	...	...	...	29 13	18 50	...	...
Riverina	33 42	31 45				20 2	25 20	...	...	...	...	10 8	...	...	23 20	4 8
Turvey	35 25	...	...	...	26 40	...	...	...	...	...	...	10 50	...	...	24 27	4 50
Union	...	...	...	...	...	...	...	...	15 51	...	...	...	...	...	...	...
Wandilla	33 20	...	...	18 19	25 52	...	...	13 28	16 50	16 38	...	10 30	18 52	...	29 27	...
Waratah	28 1	28 31	12 23	22 19	...	27 20	26 13	16 12	17 39	20 29	23 14	11 28	22 13	22 23	...	5 4
White Hard Federation.	...	...	...	...	...	...	...	...	...	...	...	...	...	17 37	...	...
Yandilla King ..	...	...	...		26 35	...	...	...	...	...	...	...	...	...	29 23	...

Manurial Trials.

Fertiliser, lb. per acre	Barellan. (G. Gow.)	Barellan. (H. T. Manning.)	Berrigan.	Coolamon.	Cunningar.	Hillston.	Lake Cargelligo. (G. C. P. Circuitt)	Lake Cargelligo. (T. W. Turner).	Mathoura.	Milbrulong.	Mirrool.	Moombooldool.	Ungarie.	West Wyalong.	Young.	Yuluma.
Raw Rock Phosphate—56	...	...	...	...	...	...	...	...	...	...	...	...	...	17 50	...	...
High-grade Superphosphate—67	...	...	...	...	...	...	...	24 58	...	...	...	...	...	15 0	...	...
High-grade Superphosphate—45	...		...	...			24 50	...	...	...	...	...	...	...	...	...
Superphosphate—56	33 41	29 55	14 53	17 36	23 23	27 20	31 3	20 8	18 28	...	20 49	...	24 28	15 27	29 16	5 12
84 .. .	31 56	30 55	15 39	18 32	26 35	20 0	29 39	20 20	18 45	18 47	21 12	11 52	24 24	15 38	29 23	...
112	28 25	31 38	14 23	...	...	...	26 22	18 46	19 50	21 46	...	...	...	...	28 3	...
130	...	...	...	...	...	...	...	...	...	22 22	...	13 10	...	...	...	7 34
170	...	...	...	...	...	...	...	...	...	...	...	13 30	...	...	...	...

Loose smut appears to be on the increase, and farmers are advised to pay more attention to the securing of seed from a crop free from this trouble. If seed is grown from a crop showing loose smut the resultant crop is sure to have this disease present.

Now that the dry copper carbonate treatment for the prevention of bunt is almost universally used, hardly any bunt is to be found, the only instances occurring where the seed has been treated with bluestone or sown without treatment.

Manurial Trials.

The dry season influenced these results to some extent. At most centres 84 lb. of superphosphate proved a more profitable application than 56 lb., especially where the fallows were in good condition. At Milbrulong 130 lb. of superphosphate gave the highest yield, and at Moombooldool 170 lb., although it gave the highest yield, did not produce so profitable an increase as the application of 130 lb. of superphosphate.

An imported ground rock phosphate was tried at West Wyalong. On analysis, 54 lb. of this rock phosphate is equivalent to 85 lb. of ordinary superphosphate. It gave a much better yield than either of the superphosphates tried in comparison with it, but it has to be remembered that this is the first trial and that the conditions were abnormal.

Oat Variety Trials.

Oat variety trials were planted at two centres, and considering the dry season particularly heavy yields were obtained at both places.

The early-maturing varieties again demonstrated their suitability. Algerian, which is late maturing, gave the lowest yield at each centre. This variety must be sown early to obtain the best results. This necessity for early sowing interferes, of course, with the sowing of the main crop, viz., wheat. Consequently, the growing of oats has in the past been unpopular. The advent of the recently-produced early-maturing varieties such as Mulga and Sunrise have removed this objection to the growing of oats, as these varieties need not be sown until late in the season, when wheat sowing is completed. In spite of this late sowing, these varieties are ready to harvest before the wheat crops, and they produce very heavy yields. They are undoubtedly destined to popularise the growing of oats on a large scale.

Farmers are now considering the advisability of feeding their horses on oaten chaff to check the spread of flag smut and many are preparing to sow early varieties of oats such as Mulga, Sunrise, and Myall around their wheat-crop headlands, so that they can be cut for hay.

Variety.	Coolamon.		Milbrulong.	
	bus.	lb.	bus.	lb.
Algerian	34	35	28	20
Belar	38	39	33	3
Lachlan	38	11	...	...
Mulga	40	19	38	22
Myall	40	22	34	20
Sunrise...	...	...	37	11

Lamb-raising Trials, Season 1925.

E. A. ELLIOTT, Sheep and Wool Instructor.

Bathurst Experiment Farm.

THE trials were carried out on the same lines as last year, Dorset Horn and Ryeland rams being mated with Border Leicester x Merino ewes. Mating commenced on 19th January, 2 per cent. of rams being used. Both breeds of rams worked well, though the Ryeland was slow in making a start. The rams were removed on 2nd March. As is usual at Bathurst Experiment Farm, the flock was yarded nightly.

The sheep were run on the stubble land and natural pasture, but on account of the dry season it became necessary to hand-feed during April. On 23rd April the sheep were given wheaten chaff at the rate of ½ lb. per head per day. This ration was continued until the last week in May, when bran was added at the rate of 1½ oz. per head per day. Pastoral conditions were still dry at the middle of June and a complete change was made in the feeding, lucerne chaff at the rate of slightly under ½ lb. per head and wheat at 1½ oz. per head being fed to the sheep daily until the end of June, the ewes maintaining their condition.

On account of the dry condition of the pastures prior to and at the beginning of lambing, a number of ewes developed preparturient apoplexy, and 2 lb. Epsom salts was added each night to their food. Individual cases were dosed with Epsom salts and put in a small lucerne paddock. Four ewes, each carrying twin lambs, were lost from the above cause.

Lambing commenced on 13th June, but was slow for the first fortnight. Twelve ewes required assistance; two cases were breech presentations and in the remainder the main trouble was due to the size of the heads of the lambs. The lambs were marked on 27th July at an average age of from three to four weeks. The following table shows details of the lambing:—

Breed of Lamb.	No. of ewes mated.	Ewes assisted.	Ewes died	Lambs born.	Deaths of lambs before marking.	No of twins	Lambs marked	Percentage.
Dorset Horn cross ...	159	8	3	187	12	36	175	110
Ryeland cross	53	4	2	65	12	17	53	100

It was found necessary to rear six lambs by hand as their mothers had not sufficient milk, and one Ryeland cross lamb died between marking and the time of sale. This explains the difference between the number marked and the number sold.

The spring was very dry, the fodder crops making very little growth, and the lambs did not increase very quickly in weight. An area of approximately 32 acres of rather inferior grazing lucerne was of great assistance in keeping up the condition of the flock, the sheep being turned into the lucerne for periods varying from thirty minutes to one hour per day.

The following table shows the average weights at time of marking and prior to sale, with average increases :—

Breed of Lamb.	First weighing (3 to 4 weeks old).	Second weighing (22 weeks old).	Average increase. (132 days).
	lb.	lb.	lb.
Dorset Horn cross	19·4	76·3	56·9
Ryeland cross	19·4	72·1	52·7

Except for the six lambs that were hand-reared, the whole drop was sold at Flemington on 10th December. The Ryeland cross lambs when drafted at the sale were more even than the Dorset Horn cross lambs but were smaller. The latter were rather uneven, some being very heavy, while fourteen were on the light side. Following were the average prices realised :—

	s. d.
Dorset Horn cross (170 lambs)	24 11¾
Ryeland cross (51 lambs)	24 5½

The following table shows the net return per ewe mated :—

Breed of Lamb.	Ewes mated.	Lambs sold.	Average Price per Lamb.	Ewes Died at lambing.	Value of Ewes per head.	Total Value of Lambs.	Less Value of Ewes Died.	Average Return per Ewe Mated.
			s. d.		s.	£ s. d.	£ s. d.	s. d.
Dorset Horn cross ...	159	170	24 11¾	3	25	212 8 5	208 13 5	26 3
Ryeland cross ...	53	51	24 5½	1	25	62 7 0	61 2 0	23 0

Cowra Experiment Farm.

The trials at this farm, as at Bathurst, were carried out on the same lines as last year. The flock of Border Leicester x Merino ewes was divided between Dorset Horn and Ryeland rams, 2 per cent. of rams being used. The weather was dry during mating, and the rams did not work at once, so they were not removed until 11th March.

During mating and up till a week before lambing commenced the ewes were run on stubble and fallows, and though the feed was dry there was plenty, and the sheep kept in splendid condition. The week before the start of lambing a lucerne paddock of 20 acres was fed off by the ewes. This proved very beneficial in regulating the bowels of the ewes, and ensured a milk supply for the lambs.

Lambing commenced on 3rd June, and the lambs were marked on 25th July, at an average age of four weeks. Six ewes which required assistance in the lot mated to Ryeland rams were very fat. No ewes died during the lambing period. The following table shows details of the lambing :—

Breed of Lamb.	No. of Ewes Mated.	Ewes Assisted.	Lambs Born	Deaths of Lambs before Marking.	No. of Twins.	Lambs Marked	Percentage.
Dorset Horn cross ...	128	Nil.	142	8	14	134	104·7
Ryeland cross ...	100	6	98	6	8	92	92·0

On account of good winter rains, the fodder crop of rape and barley (15 acres) made very good growth, and in conjunction with the natural pasture provided an abundance of feed. The lambs grew very well, the Dorset Horn cross lambs having a slightly better appearance when seen at intervals during their growth. The lambs were weighed three times during their growth, the first time a fortnight after marking. The following table shows the average weights and increases :—

Breed of Lamb.	First Weighing (6 weeks old).		Second Weighing (3 months old)		Increase		Third Weighing (4 months old).		Average Increase First to Third Weighing (72 days).	
	Ewes.	Wethers.	Ewes.	Wethers	Ewes	Wethers	Ewes.	Wethers.	Ewes	Wethers.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Dorset Horn cross ...	40·0	40·2	63·8	67·3	23 8	27·1	71·8	74·3	31·8	34 3
Ryeland cross ...	37·6	37·1	58·5	57·9	20·9	20 8	72 8	76 4	35·2	39·3

The bulk of the lambs were sold at Flemington on 19th November, when the following prices were realised :—

Breed of Lamb.	Prices Realised.	Total Price.	Total No. of Lambs.	Average Price.
	s. d.	£ s. d.		s. d.
Dorset Horn cross	68 lambs @ 25 10 32 „ @ 19 7	119 3 4	100	23 10
Ryland cross	44 „ @ 26 10 36 „ @ 21 7	97 17 8	80	24 5½

When forwarding the lambs to market it was found that twenty-nine Dorset Horn cross lambs and eleven Ryeland cross lambs, which comprised the late lambs of the drop, were not sufficiently well grown. These lambs will be utilised for mutton on the farm, as there are not enough to make up a truck for market. For the sake of this trial they were valued at 14s. per head at the time of the sale of the other lambs.

The following table shows the net return per ewe mated :—

Breed of Lamb	Ewes Mated.	Lambs Sold.	Average Price per Lamb.	Lambs retained. No.	Lambs retained. Value per Head.	Total Value of Lambs	Average Return per Ewe Mated.
			s. d.		s.	£ s. d	s. d.
Dorset Horn cross ..	128	100	23 10	29	14	139 19 4	21 10½
Ryeland cross	100	80	24 5½	11	14	105 11 8	21 1½

A Feature That Too Many Farms Lack.

Australia in general is most indifferent to the possibilities of the home fruit and vegetable garden, pointed out Mr. H. M. Bloomfield in an address at the recent Agricultural Bureau Conference at Bega. Travellers were astonished with the innumerable ways in which the fruit and vegetable wealth was utilised in some countries. Fruit was regarded locally as a supplement to a meal rather than as a part, and more often was conspicuous by its absence.

"There is no ordinary suburban householder and no dweller in a country town whose ground is too small to grow an ample supply of vegetables. I know a man in this town who not only supplies his family with vegetables off about 10 square yards, but sells a surplus. Fruit trees should have at least from 15 to 20 feet clear from each other, therefore a square chain or so is necessary to get variety, but it is quite simple to have half-a-dozen varieties on one tree and so get succession in very little space. I saw a photo of an apple tree a short time ago with twenty-seven varieties."

The Benefit of Phosphate Manuring to Swedes.

The special dependence of swedes on an ample supply of readily available phosphate is emphasised in a summary in the *Welsh Journal of Agriculture* of experiments extending over the past forty years. In 232 tests the effect of phosphatic manuring was to increase the crop in 186 cases by at least 10 per cent., and taking all the trials together the average increase in crop as a result of phosphate manuring was 49 per cent. The effect of potash manuring was on the whole much less pronounced, and at two-thirds of the centres the applications probably proved unprofitable. Nitrogenous manures rarely produced an increase of crop sufficient to cover the cost of the manure.

In the great majority of the trials phosphate was applied in the form of superphosphate, but basic slag and finely ground mineral phosphates proved efficient substitutes in the cases where they were tried.

Damage to Wool from Dust.

H. N. WILDMAN, Assistant Sheep and Wool Instructor, Wagga Experiment Farm.

In mixed farming propositions, the damage done to the prospective wool clip by unnecessary exposure of the sheep to the dust is a matter which with a little forethought and selection of the right type of sheep can be considerably minimised.

Undoubtedly on a wheat and sheep farm where fallows are being fed off from time to time as they become more or less dirty with black oats and various weeds, the crossbreds should be used in despasturing the paddock in preference to the merino. Most farmers are aware that merino wool contains considerably more yolk or natural grease than crossbred wool, and that dust adheres more readily to greasy wool. The question often arises, "Why did my neighbour receive more for his merino wool than I did"? The reply is very simple; the wool was of similar quality, but his sheep were run on grass land, whereas the others were on fallows and contained more dust.

Often very little attention is given to sheep at the time they are being shorn to prevent the mob from raising dust. Unnecessary yarding, dusty tracks to the paddock, &c., may all raise dust that will penetrate to the skin and remain to form the tip of the staple. This dust absorbs the natural grease which is needed for the healthy and sound growth of the fibre, and, furthermore, spoils the appearance of the wool. The tip of the wool becomes dry and fuzzy, resulting, firstly, in a heavy sinkage in scouring owing to the quantity of dust, in the manufacture of a low yield of top, and in an undesirably heavy proportion of "noils."

This waste can be eliminated, to a great extent, by allowing the sheep as much spread as possible when mustering or droving. Constant rounding of the sheep by dogs stirs up dust and works it into the staple. Drovers are often apt to drive sheep on roadways which are devoid of feed and are dusty. The progress of the sheep in such cases is certainly easy, but by utilising the full width of the stock route the sheep would arrive in a less dusty condition.

A marked difference often exhibits itself where farmers purchase sheep from saleyards from the same flock, dividing them and droving by different routes. The road with the less traffic is usually cleaner and the sheep arrive with less dust in their fleeces. The consequence is a better price per pound for the cleaner and brighter wool when the sheep are shorn. It is, therefore, quite evident that every particle of dust which adheres to the fleece reduces its yield and detracts from its appearance and brilliancy.

The fact that wool is bright and clean attracts the buyer's eye, especially since one of the factors influencing his purchase is the percentage of clean yield. The care of sheep and the prevention of dust gaining admission

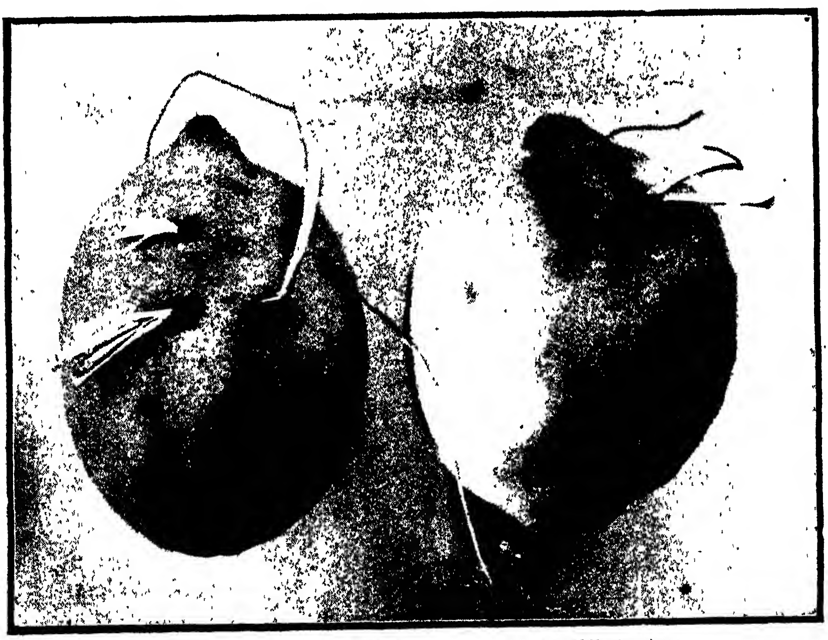
when it can be avoided from shearing to shearing will assist greatly in attaining such perfection. On some stations it is the practice to water the yards at intervals by means of a hose, to keep down the dust. Such a sound and inexpensive method might well be adopted at many yards.

To Overcome Black Oats.

"Consolidate your land by fallowing early; give plenty of working while the soil is moist; wait for the weeds to start before sowing; then sow plenty of seed and superphosphate, and you won't lose much sleep about black oats."—D. Kelly, "Willochra," Parkes, at the Agricultural Bureau Conference at Dubbo.

And They Remained Sound!

The accompanying photograph illustrates an odd development observed during the storage of some lemons in the open. A small piece of ground had been prepared by chipping off the "bladey" grass and spreading it with sawdust. Layers of sawdust were then alternated with layers of fruit until the mound was completed. The lemons were put down on 14th July, and



Lemons through which "bladey" grass had grown while in store.

when inspected on 30th November quite a number were found to be penetrated by the grass in the manner shown. In one case the grass had grown 9 inches after piercing the fruit. The efficiency of sawdust as a method of preserving lemons over several months could hardly be better proved.—W. B. Stokes, Orchard Inspector.

Wimmera Rye Grass.

Trials in New South Wales.

J. N. WHITTET, H.D.A., Agrostologist.

WIMMERA rye grass has produced excellent results in many parts of this State, and gives promise of being a useful grass in many districts where dry conditions are met with, and where rapid growing pasture plants are required.

The origin of the plant is more or less obscure. Botanically, it is closely allied to a worthless grass, Rigid rye (*Lolium rigidum* Gaud.), but Wimmera rye grass is more palatable to stock, being more leafy and softer in the stem than Rigid rye. Some six years ago Wimmera rye grass was thought to be identical with *Lolium subulatum* Vis., but, as a result of recent investigations it has been classified as *Lolium rigidum*, var. *strictum* Jansen.

Mr. H. G. Mullett, B.Ag.Sc., Superintendent of Agriculture, Victoria, first drew attention to the value of this grass in the *Journal of Agriculture*, Victoria, May, 1919. It has produced such excellent results in the Wimmera district, especially during dry seasons, that its cultivation as temporary pasture was also advocated in many parts of the Mallee. In New South Wales it has been extensively grown during the past five years, but principally by ex-Victorian farmers and graziers. In tests that we have conducted, Wimmera rye grass is proving particularly useful in situations where other palatable grasses are difficult to establish.

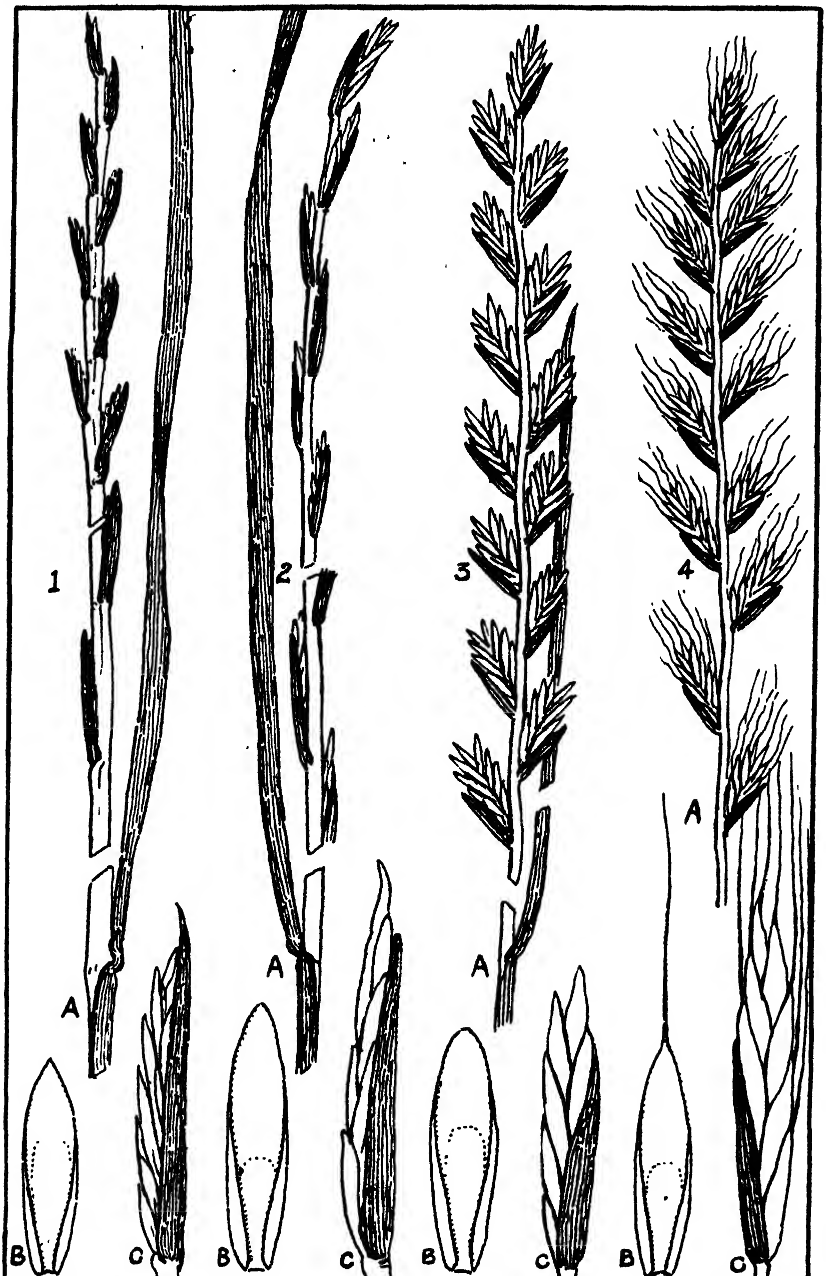
Some interesting information concerning the early history of this grass has been supplied by Wimmera farmers. They consider that it was brought from Europe by a Mr. McNichol, and planted about 1887 on his farm at Noradjuha, near Horsham. This farm is now owned by Mr. Reuben Light, and seed was obtained from that source by many Wimmera farmers.

Messrs. McDougall Brothers, Minyip, Victoria, have had this grass on their property for over thirty years, and most of the seed sown of late years in New South Wales came from their farm. The altitude of Minyip is 426 feet, and the average annual rainfall approximates 17 inches.

Suitability to Various Districts.

Its value as a pasture plant is considerably enhanced by the fact that it is readily eaten by all classes of stock, and that it adapts itself to varying climatic conditions. As the seed germinates freely and rapidly, Wimmera rye grass will establish itself in the first place from sown seed, and thence every year from self-sown material.

In the following localities in New South Wales, Wimmera rye has given satisfactory results, the areas ranging from 2 acres to 400 acres:— Grafton, Dorrigo, Kempsey, Taree, Richmond, Camden, Berry, Moss Vale,



The Rye Grasses.

1.—Rigid Rye grass (*Lolium rigidum*)
2.—Wimmera Rye grass (*Lolium rigidum.* var. *strictum*)
3.—Perennial Rye grass (*Lolium perenne*)
4.—Italian Rye grass (*Lolium italicum*)

A shows flowering spikes in each case; B seeds; C spikelets.

Note how the seed of Wimmera Rye grass is held by the long outer glume, whereas in Perennial and Italian Rye grasses the spikelets open out and the seed shatters very readily.

Curlewis, Werris Creek, Inverell, Singleton, Bathurst, Orange, Rylstone, Wattamondara, Crookwell, Captain's Flat, Cooma, Gundagai, Tumut, Parkes, Temora, Milbrulong, Urana, Yerong Creek, Illabo, Coonamble, Trangie, and Nyngan.

Sowing.

The seed should be sown in March or April to obtain the best results; the planting period may be extended to May or June, but autumn sowings are preferred to later ones.

On the *poorer classes of soils in coastal districts* the use of 2 lb. of Wimmera rye grass seed in a grass mixture has proved very satisfactory. On the better class land Perennial rye grass is preferred to Wimmera, as the former provides a greater bulk and range of feed than the latter.

In Paspalum and Couch grass pastures satisfactory results have been obtained by broadcasting seed of Wimmera rye, the rye providing green feed during the cooler months of the year.

In wheat districts, being a rapid-growing, free-seeding annual, it should only be sown on areas which are to be given over to grazing for a number of years. In Riverina and parts of the tablelands and slopes, lucerne gives satisfactory results as a grazing crop, and consequently a useful mixture to sow with the last wheat crop is Wimmera rye 3 lb., and lucerne 2 lb. per acre. When the wheat crop is ready for stripping, the Wimmera rye will have formed seed, and after the wheat is harvested the stubble, grass, and lucerne provide good grazing.

In rough country.—Although it does best when sown on cultivated land, it is most useful for broadcasting on rough country, provided sufficient litter, &c., is on the ground to hold the seed and furnish cover in which it will germinate. It must be borne in mind, however, that if rabbits are plentiful the grass will soon be eaten out, and eventually disappear because of being prevented from forming seed.

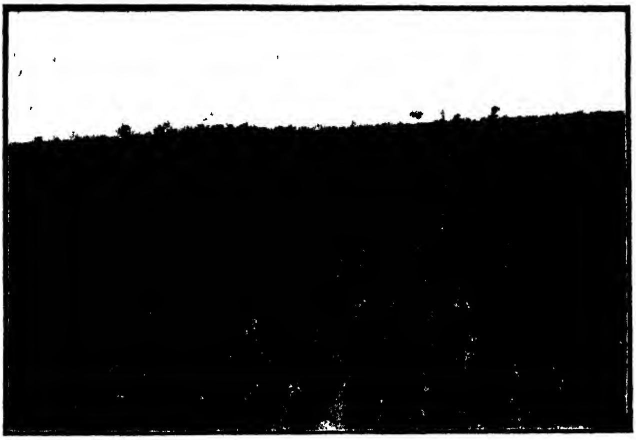
Useful for Ewes and Lambs.

To the sheep and wheat farmer this grass is undoubtedly useful, its special value lying in the fact that when grass seeds are plentiful farmers with areas of Wimmera rye have clean paddocks into which to turn lambing ewes, and so are able to market lambs free from Spear and Barley grass seeds. The seed of Wimmera rye is free from detrimental features, and consequently does not damage the wool or eyes of sheep.

Lambs reared under these conditions are free from grass-seed pimples, and therefore their carcases are in excellent condition for the export trade. In many localities lambs have to be marketed before they are at their best in order to escape grass seed, whereas if areas of Wimmera rye grass are available there is no need to worry about Corkscrew or Spear grasses and other detrimental plants.

Methods of Control.

When the time arrives that the area is required for cultivation, the Wimmera rye can be prevented from seeding and eradicated by heavily stocking the paddock with sheep. Any plants which grow on the subse-



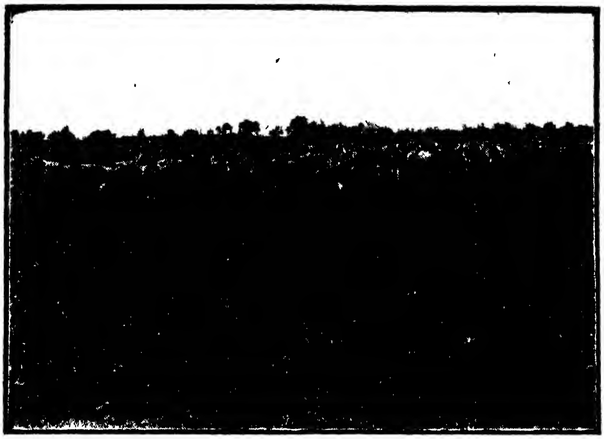
Wimmera Rye Grass at Temora Experiment Farm.
October, 1924.

Heavy Growth of Wimmera Rye Grass amongst Wheat.

The fallow had not been properly handled and the grass came away with the wheat. This can be avoided by sound methods of cultivation.

quent fallow can be controlled by feeding them off and working the fallow. A cultivator with broad tines, such as a duck-foot, should be used when the seedlings are just showing through the ground.

In the hands of a careless farmer, Wimmera rye grass may give trouble in wheat areas; if the seed is plentiful in land sown with wheat the grass will check the growth of the crop considerably. As most of the wheat is now sown on fallowed land, and the grass is relished by sheep, heavy stocking and clean cultivation methods will keep it under control.



In the Wimmera District in Victoria.
This area of Wimmera Rye grass pasture carried two sheep per acre right through 1925, the rainfall for the year being only 12·86 inches.

Wheat Stubble, Lucerne and Wimmera Rye Grass mixed.
At Mr. G. F. Hutchings, Yerong Creek, March, 1925.

Perennial Strains.

The plant invariably acts as an annual, and consequently should be allowed to seed in November or December of each year, though from selections made in Riverina we have isolated strains which give promise of

being perennial in character. These should prove valuable not only in the drier parts of the State, but also on those parts of the tablelands which are too dry for Perennial rye (*Lolium perenne*).

Provides Good Pasture even when Dry.

A special feature of Wimmera rye is the fact that the plants retain their seed well, the long outer glume holding the seed firmly against the seed stem. Sheep readily eat these dry seed stems, and thus obtain a certain amount of grain with their roughage.

As Hay or Chaff.

Wimmera rye makes good quality hay and cuts into attractive-looking chaff. Rats and mice do not damage the hay or grain stacks, as the seed is small and does not tempt them to the same extent as oats and wheat do. This feature makes the grass an excellent standby for times of drought.

Buyers of chaff, however, do not like handling a mixture of grass and oaten or grass and wheaten chaff, and it is advisable for intending growers of Wimmera rye to consider this aspect of the question before sowing on their properties.

Farmers and graziers who have cut and fed a mixture of Wimmera rye chaff with either wheaten or oaten chaff consider that stock do better on the mixture than if fed wheaten or oaten chaff alone. This is accounted for by the fact that the Wimmera rye would be carrying a large quantity of seed, which would make the mixture more nutritious. The grass retains an excellent colour, even when the seed is well matured, and there is also an absence of discoloured flag on the sample of hay produced.

Setting the Pace in Dairying Progress.

The trend of the dairying industry to-day is in the direction of still greater uniformity. Before any substantial headway can be made in this direction, however, the foundation of the industry will need to attain a higher state of efficiency. As a set-off against the extraordinary progress in the secondary stage of the industry, the producing section has, in the last thirty years, made little progress deserving of recognition. The separator (which came into use prior to the period mentioned), and the milking machine (a more recent introduction) are labour-saving devices of a high standard. But the dairy herd of to-day is in many instances the dairy herd of 1895 in point of producing capacity.

It is not fully recognised by the average dairy-farmer that dairying is responsive to the application of ordinary business principles. Viewed from a strictly commercial standpoint, a cow is not merely "old Strawberry"—she is an instrument of production, and should be applied to that end to the fullest possible means.—E. T. Boller, at Bega Agricultural Bureau Conference.

Wagga Fodder Conservation Competition.

L. S. HARRISON, Senior Agricultural Instructor.*

THE urgent need for some system of fodder conservation is now widely recognised, and this competition was inaugurated with the hope that it will act as a stimulus to those who are not already making the very necessary provision of adequate fodder reserves. The publicity given to the facts and information collected during the judging and the promotion of a spirit of friendly rivalry should induce others to adopt this form of insurance, enabling, as it does, a landholder to stock his land to the limits of its carrying capacity, a policy which, at the present comparatively high and rising land values, is obviously sound. With recurring droughts of greater or less frequency, the landholder without conserved fodders has, at periods, either to sacrifice his stock at sale, or purchase fodder at famine prices. The enormous losses of stock in past years are to be remembered, and such a competition as this may be looked upon as a distinctly progressive move, and one that deserves close attention on the grounds referred to above.

The conditions and scale of points for the "Conservation of Fodder Competition" are as follows:—

Fodders eligible for competition to be, *e.g.*, concentrates (including all grains); or roughage (as hay—lucerne, oaten, wheaten, barley, clover, grass—or silage); and any other fodder suitable for conservation.

SCALE OF POINTS.

	Points.
1.—Suitability and Quality of Fodder	35
(*a*) Judged according to the suitability of fodders for the purposes for which they are required.	
(*b*) Judged as to appearance, apparent palatability, and nutritive value.	
2.—Location and Protection	25
(*a*) Location of site, having regard to fire, flood, economy in feeding, and general access.	
(*b*) Protection from weather, pests, and general deterioration.	
3.—Cost of Production	30
To be based on relative cost of production and value for the district.	
4.—Carrying Capacity	50
Quantity and feeding value of fodder suitable for stock normally carried, and for period necessary to maintain same.	
5.—Marketing Possibility and Originality of Method of Conservation. ..	10
Total points	150

Now that sheep are recognised as an essential to the wheatgrower in preparing his cultivation, the general question of fodder conservation is as interesting to him as it is to the grazier. Throughout this competition it was found that among those who could be considered wheatgrowers, the number of sheep to the acre was (as might be anticipated) lowest, while

* Judge's report on competition conducted by Murrumbidgee P. and A. Association (Wagga).

their reserves of fodder in the form of hay was highest per head. It is reasonable to assume that in the event of highly remunerative prices offering for hay, the hay would be sold, since the proposition was a cultural rather than a grazing one. However, in judging the competition only the actual stocks of conserved fodder at the time must be considered, though qualified by the wording of clause 4 in the conditions, "and for period necessary to maintain same." The question of carrying capacity, then, had to be closely considered in its regard, for on a river frontage with a good acreage of well established lucerne, or on river flats with a heavy carrying capacity (and in consequence of greater value for purely stock purposes), it should not be necessary to feed stock as long in a drought period as would be the case of a property with 85 per cent. of its total either stubble or fallow.

Quantities could not, of course, be determined with absolute accuracy, since the depth of a pit silo cannot be checked, but very little error in this regard is considered likely.

The matter of quality is also a somewhat difficult one to determine. Hay stacks can only be seen from the outside, and silage pits only in certain places. There is sufficient indication, however, on close observation at these points to justify the thought that an estimate is reasonably correct. Further reference to the "conditions" need not be made here, but it is realised that when they were drawn up they were somewhat tentative and open to revision.

The making of hay from wheat, oats, and lucerne is a process that is now well known to all interested, although for local feeding purposes it is desirable to handle lucerne in a greener stage than is customary at present, as all the leaf can then be preserved by using the harvesting machinery at an earlier stage after cutting, and by stacking while still slightly on the green side. This will probably cause the hay to sweat a little and turn brown, but it will preserve its quality from a feeding aspect.

Silage may be made in three different containers—pits or stacks, or it may be chaffed into overhead silos. The type that is of most interest in the Wagga district is the pit, and silage may be made from practically any crop, being preserved in a succulent state by certain natural processes. It is necessary to place the greenstuff in the pit at the right stage. If too green when it is ensiled, it goes into a "squnchy" mass which is most unpalatable, and, on the other hand, if too dry it is likely to go mouldy. It is essential that pits should be adequately covered with earth after filling, preferably to a depth of 2½ to 3 feet, with a drain along each side cut in the earth outside the pit. It is also important to pile the greenstuff up, at least as far above the top of the pit as it is below. It will settle in three or four days and enable the covering to be scooped on.

These references to hay and silage are made as a result of observation during the visits to competitors. The great bulk of silage seen was of very high standard and quality, some having been down over ten years, and the making of silage is evidently fully understood by many of the competitors. Some silage seen was insufficiently weighted, and the pit not having been

sufficiently filled the sides had caved in. In such a case the silage is likely to open up badly, as it is of the utmost importance that air and moisture should be excluded and that sufficient weight should be provided.

Some galvanised iron silos for holding oats were seen during the trip round, but none were in evidence on the properties of the fodder competitors. These tanks are valuable insofar that oats may be retained with a higher degree of safety than is usually the case. Hay stacks in the main were well and securely thatched, many were protected from mice and fenced against stock, ample drains were provided to carry the run-off and the surface moisture, and generally they were protected by widely ploughed fire breaks and situated in sufficiently isolated positions to also minimise this risk. The realisation of the urgent necessity for protection against all damage should be paramount, for it is useless to incur the expense of conserving fodder if it is then going to be allowed to deteriorate through preventable means.

On Mr. A. Lewington's property of 1,800 acres at Uranquinty, attention is being paid to the question of fodder, in the form of hay, chaff, and silage. Two large chaff sheds were seen, each intended to hold about 300 tons in bags. The practice is to place the lower tier of bags on straw chaff, and then to cover the bags as they are stacked up with loose chaff to fill the interstices and thus prevent damage from mice. The loose chaff as it becomes available is then used for farm purposes. Large doors are provided at each side of the sheds, enabling waggons to pull right into and through the shed. A stack of Sudan grass hay was also seen, said to have been up for six years. This was of good colour and appearance.

On Mrs. Lewington's property of 900 acres at Uranquinty, some of the stacks were being cut into chaff at the time of inspection, the hay being of very fine quality and the sample of chaff a good one.

Mr. A. Brunskill's property "Allonby," 4,186 acres, contains an excellent supply of conserved fodder in the form of wheaten, oaten, and lucerne hay, silage and oats. The hay stacks are large and well built on a foundation of logs; this forms the nucleus of supplies for chaff-cutting purposes, besides thoroughly protecting the lower stacks of hay against damage from dampness. Where stacks are placed across or in any scattered positions in a paddock, such a supply of engine wood is valuable and a saving of time, as wood would have to be procured for chaffcutting, whereas it has already served a most necessary purpose. Hay stacks are protected against mice with galvanised iron, the fence leaning outwards, causing a quite effective barrier against mice; the stack drain is placed inside the fence, and small perforations are made in the iron at the lowest point to let the water through. Some bagged oats also was stored in a mouse-proof shed.

On the 676-acre property of Mr. G. Brunskill, "Nora Vale," there was cereal and lucerne hay, and silage and bagged oats, providing a good reserve supply of fodder.

Mr. G. N. Lyons, on a property of 637 acres, has a good stack of lucerne hay, together with wheaten and oaten, and a little silage.

Messrs. A. Brunskill and Sons' property of 4,752 acres, "Old Borambala," has only a comparatively small acreage under cultivation, the conserved fodder consisting of wheaten and oaten hay, and lucerne hay and silage, The stacks and pits were of large dimension, which minimises the percentage of loss, as any outside damage is on a proportionately less scale than that on small stacks and pits when held for any length of time.

Miss Claughton's property, "Windamarra," of 3,500 acres, has a large quantity of lucerne hay and silage stored. Some of the pits and stacks are intentionally on the small side, and in contradistinction to the large stacks and pits on "Old Borambala" the contention was that some smaller pits and stacks were advantageous when only a limited quantity was required to complete a feeding period.

Gerelgambeth Estate Ltd., "Illabo," of 1,632 acres, has fodder reserves composed of wheaten, oaten, and lucerne hay, and some silage. A proportion of the lucerne hay is stacked, pressed in small bales. The two silage pits are placed adjacent to a somewhat steep creek bank, forming an excellent get-away for any soakage.

Mr. A. Wilson's property of 950 acres, at Old Junee, contains fodder reserves of wheaten and oaten hay.

Mr. W. H. Friend's "Wokolena," containing 2,628 acres, has a number of lucerne hay stacks and a considerable quantity of pressed hay in small bales stacked in a shed. There is a very large irrigation plant on this property, enabling a large area of lucerne to be watered in the minimum of time.

Competitor.	Suitability and Quality of Fodder.	Location and Protection.	Cost.	Carrying Capacity.	Other Qualities.*	Total.
A Brunskill	32	23	24	30	8	117
G Brunskill .. .	27	17	22	42	7	115
Miss Claughton ..	28	16	26	33	6	109
Mrs. Lewington .	21	16	22	42	7	108
G. H. Lyons	25	16	24	34	7	106
A. Lewington ..	22	18	22	34	7	103
A. Wilson	20	14	22	41	6	103
Gerelgambeth Ltd. ..	26	18	23	26	7	100
A. Brunskill & Sons .	31	21	25	14	7	98
W. H. Friend ..	27	16	24	18	6	91

*Marketing possibility and originality of method of conservation.

State Conference of the Agricultural Bureau.

Arrangements are already well in hand for the fourth annual State Conference of the Agricultural Bureau, to take place at Hawkesbury Agricultural College from 27th to 30th July. An attractive business paper is being prepared, and the gathering promises to be no less interesting than its forerunners. As on previous occasions, delegates will be the guests of the Department at the College for the duration of the proceedings, details of which will be published later.

Dairy Farm Instruction.

IMPROVING CREAM QUALITY.

No. 2.—Central North Coast Rivers District (Manning River to Nambucca River).

L. T. MACINNES, Dairy Expert; C. J. MACDERMOT Senior Dairy Instructor; and R. WARNE, Dairy Instructor.

GOOD counsel and good example are like the ripple on a pond of water caused by the casting in of a stone The stone, or cause itself, goes to the bottom and may be buried in the mud and seen no more, but the ripple, or effect, spreads out in ever-widening circles until it touches all the grains of sand, pebbles, and blades of grass on the whole of the foreshores of the sheet of water. For blades of grass and grains of sand, substitute dairy-farmers, and apply this illustration to the sound, practical advice and demonstration given by a dairy instructor in any district where he is called upon to clear up the seeming mystery which causes second-grade cream, to the mental annoyance and financial loss of some well-meaning but ill-informed milk or cream supplier. The instructor may be transferred to another district, he may never visit that particular centre again—like the stone he disappears—but his counsel and example continue to ripple outwards while neighbour tells neighbour how he has benefited by the advice given.

The experiences related in the following article are those of officers whose activities are expended in what is known as the Central North Coast (Middle Rivers district) of New South Wales. The district is bounded on the north by the Nambucca River and on the south by the Manning River. It runs inland from the Pacific Ocean to the foothills of the range of mountains that extends north and south a few score miles inland from the seaboard of New South Wales. In this district there is a considerable manufacture of milk products, such as butter, cheese, and condensed milk. Factories manufacturing butter greatly predominate in number and in importance as regards volume and value of output.

Last year these factories manufactured 8,150 tons of butter, valued at £1,385,000, and some £225,000 worth of other milk products was placed on the local and overseas markets. To this has to be added the values of bacon manufactured and pigs sold for other purposes—items that are generally credited to the earnings of every dairy-farmer. The total, which was approximately £2,000,000, gives some idea of the importance of this district in relation to the value of the dairy products marketed by New South Wales for the year 1924-25 (about £14,000,000). Last year considerable trouble was experienced in the district with inferior cream, and in spite of all the care taken this was reflected in the quality of the manufactured

articles. If it had not been for the fact that many of the factories operating there had been recently strengthened by increased and improved plant, and by new or renovated premises, the losses from marketing a deteriorated and inferior product must have been considerably greater. Thanks to the great improvements made at the manufacturing end—improvements both of plant and methods, for which the staff of the Dairy Branch must receive credit, and to the improvement in the quality of the raw material (milk and cream) as a result of the instructions given directly by the Department's instructors, or obtained indirectly from those who had been in contact with these officials—the quality of the butter manufactured this year is generally superior to that of last year.

Many Factors Influence Quality.

The question of improving the quality of the milk and cream delivered to dairy produce factories is not nearly as easy as some people imagine, and in some instances it becomes a difficult matter indeed. There are many different influences affecting the question, and if the treatment on the farm was the only point, it would be a good deal easier. Unfortunately, in this district, there are also other influences—some permanent, some transitory.

The influence of season on quality is marked here, and last season was one of the most difficult for the production of a consistently high grade cream, particularly during January, February, and March. The general conditions prevailing were such that bacteriological development took place at an enormous rate, and consequently the keeping quality of milk and cream was not nearly so good as it would have been under different conditions. This was particularly noticeable on the river flats, where the milk produced was of a "soft" nature. New problems are met with at such times, and nothing but the most approved methods in the care of milk and cream will give satisfactory results.

In heavy seasons, such as 1924-25, the work on the farm is increased considerably. In many instances it becomes so heavy that certain daily duties are sometimes neglected or are not done sufficiently well, which influences the quality of milk or cream produced. It is a difficult matter to find satisfactory labour for the increased work, and consequently something has to be left undone. Taking these points into consideration, it is only natural to expect that in seasons of heavy production quality is more difficult to maintain, and this is certainly the case.

Frequency of Delivery.

One method of assisting to maintain quality at such a time is the provision of more frequent transit to the factory. In such seasons daily deliveries are of immense value from a quality point of view. Unfortunately, the existing conditions in the Central North Coast will not permit of daily deliveries being general at the present time. The bulk of the cream is delivered three and four times weekly during the summer months,

while a small portion is brought in daily. At some future date daily deliveries will be much more common, and they will help tremendously in maintaining quality. In arranging cream deliveries, directions have to be guided largely by the cost, and in many instances daily deliveries are not financially warranted.

There are certain cases, however, where it would appear that more frequent deliveries could be instituted with satisfaction to all concerned. This question is constantly being brought under notice, and each year sees improvement in transit conditions. Just as the motor-lorry has largely replaced the horse-waggon for cream carriage, so daily deliveries will gradually replace the practice of three and four deliveries per week when conditions warrant it.

It is rather difficult to understand why certain farmers will not take advantage of daily deliveries when first instituted on their particular runs. There are many instances where advantage is not taken of the daily delivery until the second season. In some cases the method of charging for cream carriage has a good deal to do with this. There is always a tendency either to hold cream back, or to mix a fresh warm cream straight from the separator with an older cold cream, rather than send a can partially filled. Either of these methods usually results in defects in quality, and there would be no inducement to adopt them if the charge for cream carriage was made on a quantity basis or debited by the factory, like the manufacturing charge. Several factories have adopted charging on the butter content method, while others make the charge on a gallon basis.

The transit conditions generally have greatly improved during the past three years in the Central North Coast, and many boards of directors have devoted a considerable amount of time to this very important matter. It is not meant, of course, that transit conditions are altogether responsible for the low-grade cream received at butter factories. In most instances the trouble is located on the farm, but where transit is not ideal the position is aggravated. Under such circumstances greater care is necessary in the treatment of milk and cream on the farm, and this is where individual instruction to the farmer plays such an important part.

It is, or should be, an easy matter to produce a consistently choice cream where daily deliveries operate, but it requires more care and attention to do so when forwarding only three times weekly in the summer months. It may be mentioned here that in several instances cream being delivered daily has been found to be heavily tainted, but in each case it has been due to the neglect of certain daily duties on the farm—especially with regard to the cleaning of utensils.

Quit Cold Water Washings.

Mention must also be made of a practice which is very common, and which is highly undesirable. Investigation has disclosed the fact that in many instances the washing of the utensils and separator parts after the

evening milking is done in cold water, and the utensils are not scalded, as is so essential. The idea that one good wash-up per day is all that is necessary is all too prevalent, and the practice of washing up in cold water only at night is one that cannot be too strongly condemned from every point of view. It must inevitably result in an inferior cream. After being thoroughly washed, all utensils and separator parts should be steeped in boiling water for at least five minutes twice daily. On farms which are still in the making, or where there is still clearing up work to do (and there are many such), this very important work is sometimes neglected, or is delegated to young children to carry out—often without much thoroughness. Too much emphasis cannot be laid on this all-important point, in view of the fact that the greater percentage of inferior cream is caused primarily by the improper care of daily utensils.

The Milking Machine.

The increasing use of the milking machine brings forward another important influence on cream quality. Until a standard method of cleaning milking machine plants is adopted, quality is likely to be affected where daily cleaning operations are not properly carried out. The methods recommended by the Dairy Branch have been found to give good results when properly attended to. A plentiful water supply is essential for this purpose.

From the progress being made in different directions, it would appear that it will only be a comparatively short time before the amount of second-quality butter manufactured will be reduced to a very small percentage. The elimination of most of the low-quality butter is a goal worth aiming for, for it will have a beneficial effect on the industry in many ways. To accomplish this the first essential feature is the closest co-operation between the producer, the manufacturer, and the instructor.

A great many suppliers fail to attend in detail to the proper cleaning of utensils, and when their cream is graded second, they consider that they are being victimised by the grader or manager; but when defects are pointed out they recognise their error. It is a common thing to see petrol tins which are contaminated in the seams used for containing milk or cream, though otherwise clean. Unclean rags used for washing up is another prolific source of infection.

In other cases everything may be clean, but damage is caused by improper treatment, such as running warm cream on to cold cream, not mixing cream, &c.

The Instructors' Work.

The first step in the production of choicest butter is to obtain a sound, choice cream. Therefore the first thing to be done is to improve the quality of the raw material. With this end in view the Dairy Branch has instituted a system of instruction to suppliers on the farm. It was recognised that much damage to cream was being done through lack of proper treatment,

and it was to meet this want that instruction on the farm itself was entered upon. If the cream remained low in grade, much of the good obtained by the erection of good factories and expensive machinery would be lost.

Very many dairy-farmers have had no opportunity of obtaining any technical knowledge, particularly from a bacteriological point of view, regarding the production of choicest quality cream. It is hoped that by bringing instruction on this matter right to their doors much good will be done. That this hope is justified has already been proved by the fact that there has been an immediate great improvement in the cream supplied by many dairies after instruction has been given, the proportion amounting to between 70 and 80 per cent. of the farms visited. These figures are based on the reports received from the factories concerned.

While cream becomes second quality from a number of causes (some of which are beyond the control of the suppliers), the chief cause of deterioration is insufficient care in the cleansing of the utensils and separator pans in the dairy. It would appear that this defect is responsible for about 90 per cent. of inferior cream in the district. This is particularly noticeable in the case of milking machines. While most of the present-day milking machines are satisfactory in construction and do their work efficiently, a great number of operators fail to give them the attention required to keep them in a clean condition.

It would appear difficult for a number of farmers to understand the importance of bacteria and their effect upon cream and milk. Sometimes we have come across suppliers who could not be termed careless in a general way, but who would not hesitate to milk fifteen or twenty cows without once washing their hands. They fail to see the connection between this practice and inferior cream, and it is here that the work of instruction really begins by explaining the need for absolute cleanliness when milking, and also in the subsequent care of cream till it is delivered at the factory. In this connection the importance of cooling the cream is always stressed.

Two Cases in Point.

To illustrate this point, two instances may be quoted:—

No. 1 *Dairy.*—This dairy was in an unclean state generally, and the milk tap of the vat was more than half blocked up with decomposed milk. These defects were pointed out and particular attention drawn to the condition of the milk tap. The farmer replied that in his opinion the unclean tap would cause no harm as the milk merely ran straight through it. He could not understand, until after much explanation, that every ounce of milk was being contaminated in that manner.

No. 2 *Dairy.*—This dairy was supplying cream which was badly fermented. The dairy at first glance appeared to be in good order. The separator parts were well cleaned, and there was a general air of cleanliness. Pursuing the investigation further, the milk cans which received the milk when drawn from the cows were inspected. These had not been properly washed and contained a deposit of coagulated milk in the bottom of each. As soon as the warm milk was tipped in fermentation was at once set up.

This supplier failed to see, until it was explained, how a little thing like that could cause so much harm, particularly as the cream was being delivered daily.

These instances could be multiplied greatly. Without instruction such practices would go on indefinitely, causing loss and dissatisfaction. In the two instances related, however, and in the great majority of similar cases, the cream quality was lifted from second-grade to choicest, and was continued in that improved condition by following the advice given.

Damage is caused to cream in a great variety of ways, but by grading the cream on the factory floor the instructor is enabled to form a very good idea as to the cause of the trouble, and to know where to look on visiting the farm.

It is pleasing and encouraging to note that the work of the instructors is appreciated by the factory managers and welcomed by the suppliers. No matter how remote the farm or how difficult of access, the supplier is assured of instruction should he require it, and time be available. All means of conveyance are used to reach farmers as occasion demands—car, horse, and (in some out of the way places) foot.

It is a common occurrence to receive requests from several factory managers at the same time to visit their suppliers if possible. Some of these requests have to be allowed to stand over, while the more urgent cases are attended to.

This feature of the Branch's work has proved itself a very great success, both to the suppliers and to the factories.

"Grading Dairy Produce."

The grading of dairy produce is now practised in almost every exporting country. Not alone has it been found of advantage in selling the product, as affording an absolute standard of quality, but it has exercised such an influence primarily upon the manufacture and eventually upon the producer that the result everywhere has been a marked increase in the proportion of the higher grades exported. The reflex action upon the local market has been hardly less notable, for the public taste has become cultivated to the appreciation of a high quality article, and to-day there is probably hardly a community in the world that insists on such high-class butter as the Australian.

The little book before us (one of Lockwood's Manuals, covering 134 pages) discusses the technique of grading in relation to milk, cream, butter, and cheese, first indicating the factors generally influencing quality in the first two, and then discussing the grading of the latter two in greater detail. The author, Mr. G. Sutherland Thomson, was in the past Chief Dairy Adviser and Expert to the Governments of South Australia and Queensland, so that he has a knowledge of local conditions, but he also appreciates the importance of a friendly link between the manufacturer and exporter with the British grocer, who ultimately handles such a large part of the product, and whose inclusion within the grading circle is something to anticipate.

Published by Crosby Lockwood and Son, London.

Sewage Disposal for Rural Dwellings.

A. BROOKS, Works Superintendent.

SEWAGE is purified by passing it through earth, because particles of the sewage attach themselves to particles of the earth, and in this state are attacked by the oxygen of the air. This may be termed a process of filtration; it was recorded as one of the results obtained during investigations that led to the discovery of the septic tank, and clearly indicated that if nature is allowed to carry out her own work under proper conditions, certain bacteria liquefy all the solid matter in sewage, and, to a large extent, also purify the effluent. The proper disposal of this effluent is a matter of very great importance, because it is only partially purified sewage, and contains many bacteria, among which may be those capable of causing disease.

The Septic Tank.

The septic tank is certainly the best system that can be adopted for the disposal of sewage for single dwellings not served by a regular sewage system. The tank described in this article is suitable for any small house where the inmates use from 25 to 30 gallons of water for flushing purposes per head per day. If less is used it may be necessary to run clean water into the tank through the drains to provide the proper amount to dilute the contents of the tank. Storm water must not, however, be allowed to enter, and the drain pipes leading to the tank must not have any of the roof catchment connected to them. It is also detrimental to the proper working of the system to allow an undue amount of grease from the kitchen sink, strong acids, germicides, or disinfectants to enter the tank, as these destroy the bacteria. In some cases it is advisable to make separate provision for the disposal of the waste water from the bathroom and laundry to reduce the quantity of fluids entering the tank and overloading it.

Generally speaking, the septic tank may be described as a receptacle for sewage, in which it is held until it is liquefied by the active bacteria that are constantly growing in the contents. In fact the tank is a culture chamber for the growth of the bacteria, which perform the work of liquefaction. It may be further described as a dark, unventilated, water-tight chamber into which all sewage matter from the house is conveyed through glazed earthenware pipes, which must be carefully laid in trenches, with a grade of not less than 1 inch in 10 feet, and with the joints made water-tight with cement mortar, gauged two parts sand to one part cement.

The conditions necessary for the propagation of these bacteria are (1) exclusion of air and light, and (2) freedom from disturbance, such as the rush of water into the tank at or near the surface. The bacteria are already in the sewage before it enters the tank, and when the conditions are suitable, as provided in a properly constructed septic tank, they multiply very

rapidly and carry on the useful work of liquefaction of all solids. As previously stated, the effluent from the tank is not pure (it is considered to be not much less dangerous than the raw sewage), but it can be distributed through earth, which renders it quite safe.

Quite a variety of refuse (such as house slops, paper, fæcal matter, bits of rag, grease, &c.) finds its way into the tank, and on entering is held in suspension, attacked by the bacteria and liquefied, and passed out with the effluent to the absorption bed or area.

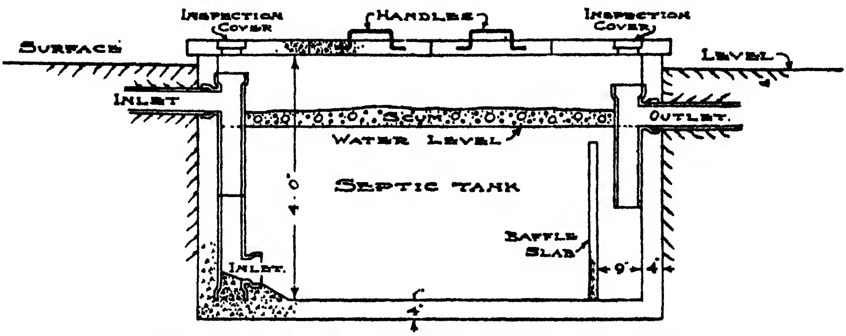


Fig. 1.—Longitudinal Section of Septic Tank for a Rural Home.

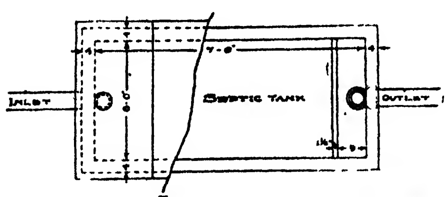


Fig. 2.—Plan of the same Tank, part uncovered.

Design and Size of Tank.

While many tanks have been installed with two or even three chambers or compartments, the tendency now is to simplify the design, and the writer has installed several one-chamber tanks which are all working quite satisfactorily.

The size required depends on the number of persons using the system. For a household of up to ten persons the inside dimensions should be 7 feet long, 3 feet wide, and 4 feet deep. This will provide sufficient space for the quantity of sewage, and space over the top of the water depth for the gas that is given off.

As the solids are liquefied a scum is formed on the top by the bits of undissolved material rising to the top. The presence of this scum is essential to the proper working of the tank, and in order that it may not be

broken the inlet pipe is carried down nearly to the bottom so that there will be no undue disturbance by the entry of the sewage. The outlet pipe is also carried down, as shown in Fig. 1, section of tank.

Tanks of less dimensions than here given are not recommended, as it is not only advisable to allow for an increase in the household, but it has been noted that smaller tanks have not been satisfactory because they frequently become overloaded, and as a consequence the sewage is not held long enough in the tank to liquefy properly.

A tank as described above, constructed of concrete walls and bottom 4 inches thick, set into the ground to the required depth, leaving the walls about 3 inches above the surrounding surface to prevent storm water gaining entrance under the cover slabs, is illustrated in Fig. 1. Where the pipe would be laid to a greater depth than shown the cover slabs could be covered over to any depth, and in this case the tank walls would not require to be any more than 4 feet high.

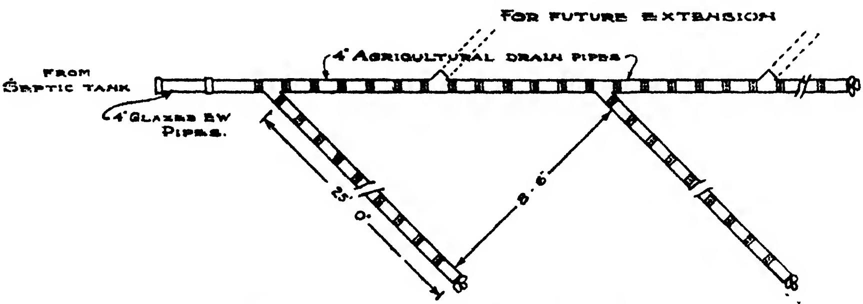


Fig. 2.—Plan of Absorption Area Drain from Septic Tank.
The drain consists of agricultural pipes laid end to end, but with spaces between each.

In the cover it is necessary to provide at least two movable slabs fitted with iron handles, also in the two end slabs to provide a cast-iron inspection cover, about 6 inches in diameter, set directly over the top ends of the inlet and outlet pipes. This provision is made so that the tank or pipes may be cleaned out if such should become necessary to remove the sludge or grit that in a few years may accumulate.

The baffle slab inserted in front of the outlet pipe is set in grooves formed in the concrete and requires to be rendered smooth on both sides.

When setting the inlet and outlet pipes, care must be taken that the outlet is set about 1½ inches below the inlet.

Disposal of the Effluent.

The effluent can be used to enrich a garden patch or for subirrigating a lawn, by laying in trenches a few lines of unglazed agricultural drain pipes, set about 12 inches under the surface, with the joints about ¼ inch apart to allow the effluent to escape freely into the soil and be taken up by the plant roots or the grass lawn (see Fig. 3). There must be not trees, shrubs or hedges near these pipes, as the roots find the open joints and block up the system.

If the position is suitable the effluent may be run out in open furrows, but the area that can be served in this way will be much less than by pipes.

Location of the Tank.

A septic tank constructed as recommended above may be placed in any convenient position near the house, and it may be close to it. The writer has seen one under the verandah floor of a hotel.

In flat country this is an advantage, because with a short length of piping discharging into the tank, the depth below the surface of the ground at the inlet is reduced, and as this regulates the depth of the pipes in the absorption area, the latter need not be laid deeper than the ordinary top soil, on the capacity of which to take up the effluent the efficiency of the system very largely depends. Where soil conditions are good and there is a good depth of top soil, the pipe may be laid deeper, or as deep as may be desired.

Location of the Absorption Area.

As previously stated, this may be in the kitchen garden, or the lawn, and at any required distance from the tank, but if the surface of the ground is nearly level, it should be as close to the tank as practicable, because a reasonable fall must be given to the pipes (say 1 inch in 10 feet), and if this fall has to be continued any great distance it means that the pipes of the area may have to be laid deeper than the top soil. In this case the trenches around the pipes should be filled in with broken stone or pebbles, at least to the bottom of the top soil, and should be opened out at least 12 inches wide to make room for sufficient stone filling.

The design shown in Fig. 3 provides for one straight line of earthenware pipes from the tank, connected to a continuation of the line laid with agricultural pipes, having Y junctions to take diagonal lines of the same pipes at 8 feet 6 inches apart, and about 25 feet long. One hundred feet of this piping should be sufficient for this tank, but in case it might be necessary to increase the length, extra junctions are inserted in the straight line, leading to the opposite side, ready to connect up to if required.

Owing to the contour of the land it may be necessary to lay these pipes in other directions, and for this purpose a diverting box is put in, as shown in Fig. 4. Over the entrance to each pipe in the box, a sliding shutter is fitted behind iron or wire hooks, set in the concrete sides of the box, as shown on Fig. 4.

If the effluent is not to be used to enrich the soil, one straight line of pipes may be laid terminating either in an open ditch or watercourse, or an absorption drain dug out and filled in with broken stone or clinker, as shown in Figs. 5 and 6.

Caution.

The septic tank system will not be a success, if either an excess of water or storm water is allowed to enter the tank.

If the water supply for the house is drawn from a well, this must not be on a lower level than the absorption area, or within 50 yards of it.

The joints of the glazed pipes must be close jointed in cement, and those of the agricultural pipes kept open and covered with stones, strips of bark, tin, or such like to allow the effluent to escape and prevent the soil from entering the pipes.

Starting the Tank.

Before allowing sewage to enter the tank for the first time, it is advisable to run about 100 gallons of water into it. It takes a few weeks for a scum to form on the top of the contents, and until this does form a slight odour will be noticed, which will disappear after the first few weeks.

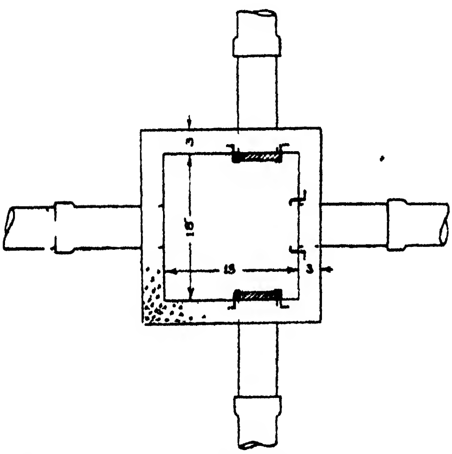


Fig. 4. Diverting Box for Septic Tank Drains.

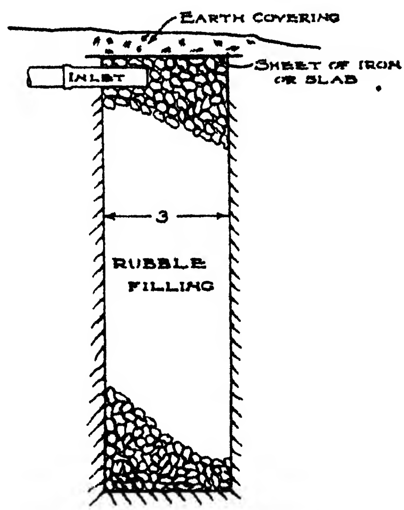


Fig. 5.—Section of Leaching Tank.

The Leaching Tank.

On some homesteads on station properties where the soil is open and deep, affording good drainage, there are what are technically called "leaching tanks" (see Fig. 5), dug to any suitable depth (varying from 6 feet to 20 feet, if necessary), and about 3 feet in diameter, lined on the sides only with dry bricks or stone, and covered over the inlet pipe with slabs or iron and earth to the surface level.

These must not, however, be adopted where the source of water supply is taken from a lower level than the bottom of the tank, or within 50 yards of it.

Such a well as above described may also have the wall-lining built in cement mortar to within a few feet from the top, and should the effluent be required for gardening purposes, a small hand pump can be attached to raise it to the surface, which would not be found such a very unpleasant job as may be imagined.

Materials Required.

To build a tank 7 feet long, 3 feet wide, and 4 feet deep, having 4-inch thick walls and bottom, 2-inch thick cover slabs, and baffle slab, the following materials will be required:—

2 cubic yards of stone, broken to 1½-inch gauge.
1½ cubic yards of clear sharp sand.
9 bags of Portland cement.
30 yards of No. 8 fencing wire for reinforcing slabs.
4 handles for slabs
2 cast iron inspection boxes.
Three 4-inch E.W. pipe square junctions.

TIMBER FOR FORMS.

For tank ...	24	feet lineal of	3-inch	x	3-inch	oregon.
	40	do	2	do	x 1	do
	14	do	4	do	x 1	do
	150	do	6	do	x 1	do
For slabs ...	30	do	3	do	x 2	do
	20	do	2	do	x 1	do
For gauging box	17	do	12	do	x 1	do
	4	do	2	do	x 1	do

Mixing and Placing the Concrete.

Unless a suitable floor is available, one will have to be laid down, say, 10 feet x 8 feet, made of 1-inch or thicker boards, laid level on sand, and close together, so that the water will not run through when mixing the concrete.

The mixture for the concrete consists of 9 cubic feet of broken stone, 4 cubic feet of sand, and one bag of cement. First mix the dry sand and cement together, until the whole is an even colour. To do this the sand can be spread over the boards and the cement spread over the sand; then with an ordinary garden rake work the whole together. Then spread over this the stones, and with square mouth shovels turn over twice while dry and again twice while being watered from either a hose and sprinkler or a garden watering can. It takes three hands to do this properly—two to turn the mixture and the third to put on the water. The whole must be thoroughly wet until it is quite mushy, and must be placed into the forms before the initial set takes place, usually in about thirty minutes.

When placing the concrete, use a piece of 3 inch x 2 inch wood as a rammer to tamp it together until the water comes to the top, and, to get a good face, use a spade against the forms to work the stones back into the walls. After the concrete has set, usually in about three days, the forms can be removed, and then the inside of the tank must be rendered or plastered over with cement mortar, ½ inch thick, composed of two parts sand to one of cement, mixed together in the same manner as for the concrete. Trowel hard to a smooth face. This rendering must be put on as soon as the forms are removed and while the concrete is "green."

The whole tank must be shaded from the hot sun and wind for a few days after completion, and occasionally sprinkled over with water to keep the work from drying out too fast. In a week after it is finished the tank is ready for use.

Reinforcement.

While there is no necessity to reinforce the tank walls or floor, the slabs, which are 2 inches thick, require to be reinforced, and this is to be done with No. 8 fencing wire laid half an inch from the bottom face of the concrete, and at spaces of 8 inches each way, forming a netting of 8 inch square mesh.

For the mixture of this concrete screen the stone through a ¼-inch sieve, using the small stuff for the first half inch to lay the wires on, and the ordinary mixture for the remainder. Over each slab plaster a thin coat of rendering

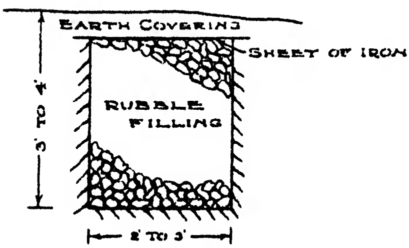


Fig. 6.—Section of Absorption Drain.

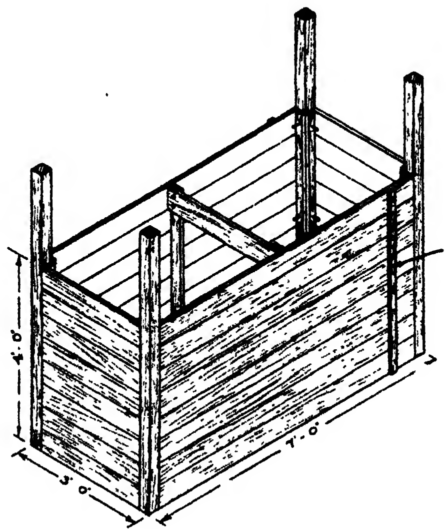


Fig. 7.—Sketch of Forms for making Septic Tank.

as for the tank to give a smooth finish. Place the handles and inspection boxes into the moulds when filling in the concrete for these slabs.

The baffle slab should be made in the same manner, but rendered on both sides.

The Excavation.

The excavation for the size of tank given requires to be 7 feet 8 inches long x 3 feet 8 inches wide, and, if the top is to stand over the surface, as shown in Fig. 1, 4 feet 1 inch deep. This allows for 4 inch thick concrete walls and floor. The sides and bottom of this pit must be cut down true and fairly smooth, to provide for an even thickness of concrete, as there must be no lumps projecting inwards that will reduce the thickness of the walls or bottom. The excavation should also be kept dry until the concrete has been placed.

The Forms or Moulds.

These should be made of pine either dressed or very smoothly sawn on the face side that will be next to the concrete.

For the tank use 3 inch x 3 inch corner posts and for the walls make the sides and ends of 6 inch x 1 inch boards, cut to 6 feet 6 inches and 2 feet 6 inches long, respectively, and nailed to the edge of 2 inch x 1 inch cleats across each end, and for the sides a 2 inch x 1 inch centre cleat, to take the cross stays at top and bottom, as indicated on the drawings. Near the end where the baffle board is to be set, nail on a 2 inch x 1 inch batten, slightly bevelled on the edges, which, when taken out, leaves a groove to take the ends of the baffle slab. At each end where the inlet and outlet pipes are to be, set a 6 inch x 6 inch square box that will form a hole for the pipes.

On reference to the drawing (Fig. 7), it will be seen that the side and end boarding is secured to the 3 inch x 3 inch corner posts, by 3 inch nails driven partly into the posts through the 2 inch x 1 inch end cleats, and the centres of the side walls are stayed by the cross 4 inch x 1 inch top and bottom.

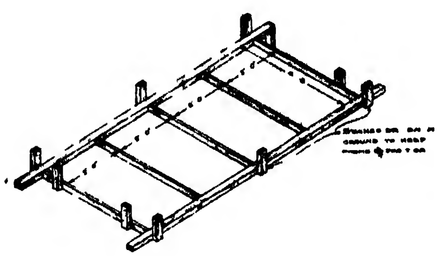


Fig. 8.—Sketch of Forms for Cover Slabs.

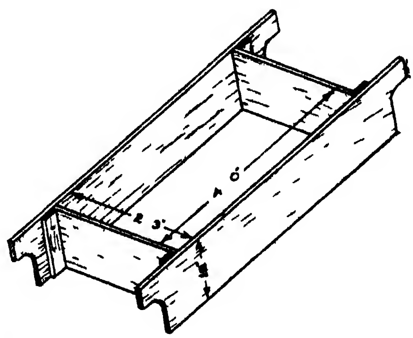


Fig. 9. Sketch of Gauging Box for Mixing Concrete.

When setting these forms they must be blocked up 4 inches from the bottom of the pit to allow the floor concrete to go under.

When placing the concrete, fill in the floor first, so that the whole shall be in one piece.

The forms for the making of the slabs are simply pieces of 3 inch x 2 inch laid down on the mixing board or on the flat ground, and temporarily secured together with pieces nailed to the board, or stakes driven into the ground as indicated in Fig. 8. The crosspieces are of 2 inch x 1 inch, set on edge. If paper is spread on the board or ground it will make the slab lift clean, and give a fairly good face.

Gauging Box.

As the drawing (Fig. 9) indicates, this is a box made of 12 inch x 1 inch boards, the sides extended and shaped for handles so that it will be easy to lift. There is no bottom to it, and the method of using it is to sit it on top of the spread sand and cement, fill with stone, and lift away. For measuring the sand, either fix a partition in the box or barely fill it.

Frost Blister of Vegetables.

W. A. BIRMINGHAM, Assistant Biologist.

DURING June, 1924, the Manager of Bathurst Experiment Farm forwarded to the Biological Branch a parcel of celery of the variety Solid White for examination.

He stated on 19th June, 1924, that "the disease is general throughout the whole plot of this variety of celery, while adjacent to it another variety of celery, White Plume, is unaffected. The disease seems only present in the upper portions of the leaf stem. The plants seem in no manner weakened by the disease. Reference has been made to various pathological publications, and none contain information on this or any other like disease."

On 8th July, 1924, the Manager wrote, "The disease has spread since first noticed, and at present no plants are uninfected. White Plume, which had previously seemed immune to the disease, also shows signs of infection."

Symptoms of the disease.—In some plants a number of the shoots had been killed back, having a water-soaked, brown appearance. Some of the leaf-stalks showed elongated blisters, due to the epidermis* being uplifted from the underlying tissues.

Fig. 1.—Frost condition in Celery.
Variety—White Plume. Bathurst Experiment Farm, July, 1924

* The true cellular skin or covering of a plant below the cuticle.

Later the blistered skin ruptures lengthwise, exposing the fibres of the leaf-stalk. Ultimately the tissues at the affected spot becomes disintegrated. A bunchy-like growth of the leaves was noted in the case of some stalks, while the leaves showed white spotting and pronounced crinkling.

Microscopical examination of diseased plants failed to reveal the presence of any parasitic organism. Plates were prepared for the presence of bacteria, and a white and a yellow species were obtained. To ascertain to what extent the bacteria were responsible, inoculation tests were carried out.

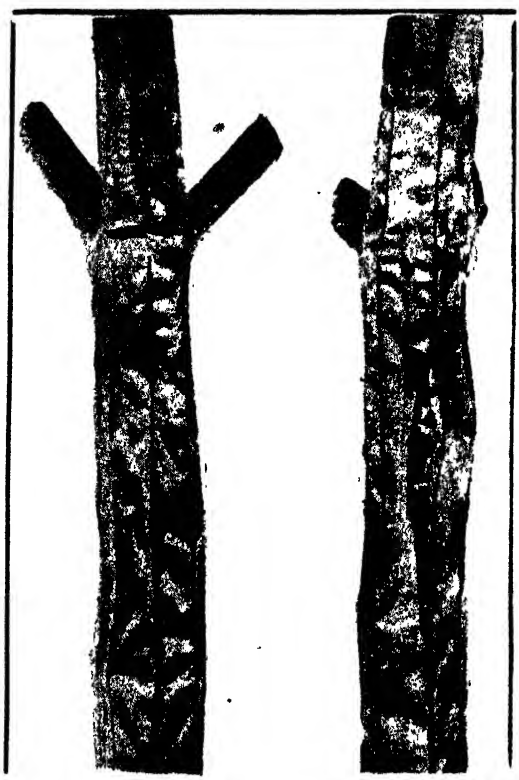


Fig. 2.—Frost condition in Celery.
Variety—Solid White. Same farm and season.

Plants of the two varieties White Plume and Solid White were raised from seed and planted out in 10-inch pots. One pot of each variety was inoculated in one case with the yellow bacterium, and in the other with the white bacterium. The inoculations were made on the 21st May, 1925, and on the 25th June, 1925 (thirty-five days after inoculation), no development had taken place.

Conclusions.—(1) That neither the white or yellow bacterium isolated from the varieties mentioned were responsible for the diseased condition of celery at Bathurst Experiment Farm.

Fig. 3.—Another Condition in Celery, due to Frost.
Variety—White Plume. Same farm and season.

(2) That the trouble was possibly due to frost, the same condition being found in celery, beet, broadbeans, and rhubarb at Aylmerton about the same time.

At Aylmerton several days of successive frosts were experienced prior to the development of the condition. The frost records for Aylmerton are not available, but the readings for Bathurst were kindly supplied by the Manager of Bathurst Experiment Farm.

FROST Records.

Date.	Degrees	Date.	Degrees.	Date.	Degrees.
1925.		1925.		1925.	
1 June	9	1 July	12	1 August ...	6
6 "	1	2 "	8	2 " ...	8
7 "	1	3 "	9	3 " ...	2
8 "	4	4 "	11	5 " ...	6
9 "	3	5 "	4	6 " ...	9
11 "	4	6 "	6	7 " ...	8
19 "	4	7 "	9	8 " ...	11
20 "	14	8 "	3	9 " ...	11
21 "	11	12 "	12	11 " ...	3
22 "	11	13 "	4	12 " ...	3
24	1	14 "	9	14 , ...	3
27 "	12	15 "	11	16 " ...	5
30 "	10	16 "	11	17 , ...	5
		17 "	13	18 " ...	3
		18 "	21	21 " ...	1
		19 "	16	29 " ...	5
		20 "	15	31 " ...	7
		21 "	4		
		27 "	6		
		28 "	8		

I am indebted to Mr. W. J. Reay for the photographs accompanying these notes.

REFERENCES.

Manual of Plant Diseases, Paul Sorauer, vol. 1, part 7, page 532.

TUBERCLE-FREE HERDS.

THE following herds of cattle have been submitted to the tuberculin test by Government veterinary officers or approved veterinary surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd :—

Owner.	Address.	Breed.	Number Tested.	Expiry date of this certification.
Department of Education.	Hurlstone Agricultural High School.	...	47	23 Nov., 1926.
"	Yanco Agricultural High School	...	29	14 Jan., 1927.
"	Eastwood Home.	...	10	7 Oct., 1926.
"	May Villa Homes	...	6	8 Jan., 1927.
W Bourke	Bellefaire Stud Farm, Appin	Jersey	31	19 Mar., 1927.

—MAX HENRY, Chief Veterinary Surgeon.

Farmers' Field Day at Tumut.

A FIELD day for the farmers of the Tumut district, arranged by the Sub-district Council of the Agricultural Bureau, in conjunction with the Department of Agriculture, was held on 15th February. Despite the unfavourable season, which confined many landholders to their holdings, owing to risk of fire, and in spite also of the gruelling heat in the early part of the day, eleven cars, conveying between sixty and seventy people, attended. A start was made soon after the arrival of the train from Sydney, which brought Mr. H. Wenholz, Mr. J. N. Whittet, and Mr. C. J. Tregenna, of the Department of Agriculture, and a round of the experiment plots was made during the day.

Farmers' Field Day in the Tumut Valley.
A stop for lunch on the banks of the Tumut River

A fertiliser trial with broom millet on the farm of Mr. J. T. Clout, Tumut Plains, was first visited, and farmers were interested to note that a plot which had been fertilised with 1¼ cwt. superphosphate per acre had a stronger growth, an earlier heading, and a heavier body of brush than the unfertilised plot beside it.

After the inspection of a maize variety trial at the farm of Mr. F. T. Dowling, Tumut Plains, an adjournment was made for a picnic lunch at the Junction bridge on the Tumut River, where several ladies officiated.

In the afternoon the clover experiment plots on the farm of Mr. A. N. Stacy attracted much attention, and Mr. Whittet and Mr. Stacy gave short talks on the clovers and answered many eager questions.

An excellent growth of maize in the duplicate variety trial on the farm of Messrs. McAdam Brothers, Lacmalac, was then inspected, interesting comparisons of the different varieties side by side being possible.

An extremely useful fertiliser trial with maize on the farm of Messrs. Butler Brothers, Bombowlee, presented clearly visible differences between the fertilised and the unfertilised areas.

The Party at the Tobacco Plots at Bombowlee.

The day was completed with an inspection of some interesting tobacco experiments on the farm of Mr. Levitt, Bombowlee, which are being conducted by officials of the British Australian Tobacco Company. Mr. C. J. Tregenna, Tobacco Expert of the Department, pointed out the features of these plots, which were most instructive.

Speaking at a meeting of the Tumut Sub-district Council held the same evening, Mr. Wenholz remarked that a milestone had been passed in the agricultural progress of the district. Four phases were to be considered in a forward movement of this kind. The first phase, that of determining the main problems or points on which further light or investigation was needed, required the co-operation of farmers with the Department of Agriculture. This co-operation had now been secured to the full in the Tumut district

by the formation of branches of the Agricultural Bureau and of the Sub-district Council, and particularly of the experiment committees in each of the branches, who discussed with the Agricultural Instructor for the district the nature of the experiments or investigations to be made.

The second phase, that of solving the problems, invoked the laying down and conduct of the experiments to determine the issue which was in doubt or which required demonstration. In this the onus lay on the agricultural committee of the Bureau of selecting the farm on which the test was to be made. It was essential that the land selected should be typical of a large part of the district, so that the results obtained could be applied over a large area.

The third phase, that of demonstrating the solution of the problem or the point under investigation to farmers under their own eyes, was only possible by such means as a farmer's field day, where the object of the experiment could be explained and observations made on the spot as to the appearance of each plot under the differing treatments. One of the advantages also of such a field day was that when the final results of the test were published locally, farmers who had inspected the experiment plots on the local field day were more interested in them than if they had just a glimpse of the results of the experiment, without having actually seen it at any stage during its growth.

The fourth phase consisted of getting the majority of farmers in the district to undertake the improved practice. It was not quite clear at present how this was going to be best executed, but it was certain that the farmers' field day, which would become definitely established in the Tumut district as an annual event, was going to help considerably towards that desirable end.

A prosperous and contented agriculture was essential to the welfare of a district, and not only would farmers value such a fixture, but business interests would begin to look forward to the field day as a means of contributing to more progressive farming.

Valuable to Maize Growers.

A bulletin which describes and classifies according to type and maturity the varieties of maize grown in New South Wales, and which pictures the great majority of them in blocks of particular excellence, is a publication which should have a decided interest for growers. Such is Farmers' Bulletin No. 152, one of the most recent departmental publications. The attention given to the improvement of maize varieties in the past few years, and the interest growers are manifesting in the subject, are in themselves indications of the importance of this bulletin, which may be recommended on the ground of the descriptive matter and also of its very fine illustrations.

The price of this bulletin (1s. 2d., post free) is remarkably low considering the eighty-seven pages of matter it comprises. It is obtainable from the Government Printer, or from the Under Secretary, Department of Agriculture, Sydney.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat :—

Canberra...	Manager, Experiment Farm, Condobolin Chaffey Bros., Nemingha House, Tamworth. J. Watson, Merriwagga. T. R. Jones, "Birdwood," Forbes. Quirk and Everett, "Narrawa," Cobbora-road, Wellington. Hobson Bros., Cunningar.
Cleveland	W. Burns, "Goongirwarrie," Carcoar. Manager, Experiment Farm, Bathurst.
Currawa...	Quirk and Everett, "Narrawa," Cobbora-road, Wellington. Hobson Bros., Cunningar.
Federation	Quirk and Everett, "Narrawa," Cobbora-road, Wellington. T. R. Jones, "Birdwood," Forbes.
Firbank	Manager, Experiment Farm, Condobolin. Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
Florence	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
Gresley	Manager, Experiment Farm, Condobolin.
Hard Federation	Hobson Bros., Cunningar.
Improved Steinwedel	Hobson Bros., Cunningar.
Rymer	Chaffey Bros , Nemingha House, Tamworth.
Waratah	Hobson Bros., Cunningar.
Yandilla King	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.

Oats :—

Algerian	Manager, Experiment Farm, Temora. Manager, Experiment Farm, Bathurst. C. Bennett, Forbes-road, Cowra. J Lyne, Farm 1636, Yenda.
Mulga	Manager, Experiment Farm, Condobolin. C. Bennett, Forbes-road, Cowra.
Reid	J. A. Reynolds, Ben Lomond.

Grasses :—

Hooker's Fescue	Manager, Experiment Farm, Glen Innes.

Broom Millet :—

White Italian	W. Lye, Loomberah.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

April.

JAMES HADLINGTON, Poultry Expert.

What with drought conditions, heat waves, and seasonal diseases on top of adverse economic factors, the poultry-farmer is having a rough time. The first two will pass away, and one can confidently look forward in the same way as any other primary producer to better times ahead. The economic conditions are to some extent capable of being controlled, and for that matter so also are the seasonal diseases, though in another way.

Diseases on Farms.

At the present time there is a more than ordinary prevalence of disease, but in nearly every case the conditions under which the birds are housed and managed are the prime causal factors. It would probably be difficult to find a farm entirely free from the causative micro-organisms and bacillus of catarrh, roup, and chicken-pox, yet all are not equally, and many not seriously, affected with this disease. Why this is so it is my purpose to explain as far as possible.

It is admitted at once that many farms that are unaffected present most of the features that one would expect to encourage disease. That is to say, the neglect of proper sanitation is such as would lead the uninitiated to expect outbreaks of diseases, yet there remains comparative freedom from them.

Experience proves conclusively that the strictest attention to sanitation in its generally accepted sense will not insure immunity from any of the diseases mentioned; yet they are to a very large degree preventable by other means.

Catarrh and roup are essentially "crowding" diseases, and no amount of disinfection or medicines will prevent their appearance where crowding is taking place. The difficulty, however, is to make clear what is meant by crowding in a way that will be understood by everyone. A farmer perhaps imagines that because his poultry houses will hold many more birds than are in them there is no question of crowding. Yet his may be a particularly bad case.

When all poultry-farmers learn the lesson, as many have done, that close perches and insufficient ventilation are the root causes of epidemics of these diseases they will almost disappear as ills to be dreaded.

The old idea that droughts are responsible for catarrh and roup, or that a bird having these diseases starts the epidemic should be scrapped. The truth of the matter is that if the conditions favourable to the development of these troubles are present we shall not long escape them. Along with

these fallacies should also be dumped the use of medicines and disinfectants. In order to keep birds healthy more attention should be paid to airy housing and the width apart between the perches, which should not be less than 20 inches, and dropping boards should be thrown to the limbo of discarded things. More than anything else, they lead to close perching and prevent a free circulation of air between the birds.

Chicken-pox is not dependent upon conditions, as is roup, but it also is very largely preventable if measures are taken in time to ward it off. This means before the actual appearance of the disease. The use of flowers of sulphur given in the morning mash at the rate as advised in these notes for January will ensure that little, if any, trouble will be experienced from this disease.

When the disease has actually broken out it will run its course, and all that can be done is to dry up the sores to keep them from spreading. There is nothing better than tincture of iodine for this purpose. However, another few weeks should see the end of this trouble as far as this year is concerned.

Foods and Feeding.

Much information has from time to time been published in these notes on matters in connection with foods and feeding. The subject is also fairly comprehensively dealt with in "Poultry Farming in New South Wales," but judging by the questions asked by farmers there is still a lack of definite knowledge on the subject. Doubtless much of this rises out of the promiscuous information picked up from all sorts of sources, which to the uninformed is more confusing than informative.

Meat Meal.

In this connection, one seeker after advice asks, "Is meat meal necessary in the morning mash?" Another inquirer wishes to know if it is necessary to use meat meal when mixing the mash with milk, and which is the better, milk or meat meal. Yet another wants to know which is the better, meat meal or a certain brand of spice, and someone else desires information on the use of lucerne meal.

Replies to these questions will doubtless be of general interest, and will assist to clear up some of the most common misconceptions in respect of feeding.

With regard to the necessity for feeding meat meal in the mash, both empirical practice and experiments go to show that the ratio of a mash composed of pollard and bran fed in conjunction with wheat, maize, oats, barley, and like cereals, forming the daily ration, is too wide, *i.e.*, it is deficient in the amount of protein necessary to sustain high production. This being the case, it is necessary to introduce some food having a higher protein content, such, for instance, as meat or meat meal, to bring up the daily ration to a proper ratio. There are, of course, vegetable products which on chemical analysis appear to supply the required nitrogenous deficiency; but in feeding poultry vegetable proteins are not regarded as

exactly substitutes for a certain amount of animal protein. This is where the person who relies solely upon analytical values of foodstuffs in making up a ration is liable to error.

Experiments and practical results indicate that 5 to 7 per cent. of a meat meal containing 60 per cent. protein matter, in conjunction with pollard, bran, wheat, and maize, is necessary to secure a proper ratio.

Milk Feeding.

Replying to the question, will milk replace meat meal in the mash, it can be stated that the quantity of milk that can be incorporated in the mash by simply mixing it with milk as it comes from the cow or the separator will not add sufficient protein to take the place of meat meal—that is, of course, in the absence of any other animal food. If, however, the milk is coagulated, and the whey drawn off, the pollard and bran or other meals forming the mash will take up sufficient curds to very nearly supply the necessary protein to fairly balance the ration But even in this way a little meat in some form is advisable. It is of little consequence whether the milk is whole or separated, because practically all the protein is retained in separated milk.

With regard to the question of spices taking the place of meat or meat-meal, spices generally are looked upon as condiments rather than as food, and taken in that way one might as well consider the question of feeding oneself on whisky in place of more substantial food.

The Economic Aspect of Feeding Lucerne Meal.

The question relating to lucerne meal requires some explanation, because good lucerne meal is an efficient substitute for at least a portion of the bran used in making up a mash. The use of this fodder in that way has been advocated in these notes, and, when not too high in price, it is regularly used in the mash on departmental farms, including Hawkesbury Agricultural College and the Government Poultry Farm at Seven Hills. Experiments carried out at the College have shown that lucerne meal can be used to the extent of 20 per cent. in the morning mash, but as a matter of fact lucerne meal is not regarded as being worth more than bran, therefore when this meal exceeds the price of bran the quantity used, if any, is small in proportion. In other words, lucerne meal is not regarded as an absolutely essential ingredient of the mash.

Economy in feeding, therefore, dictates the extent to which this article might be fed to advantage. A good deal, too, depends upon the quality. If the lucerne meal is composed principally of stalky fibrous matter, no matter how finely ground, its value as a food is impaired in proportion to the fibre content. Good leafy samples only are near the feeding value of bran. The mention of lucerne meal raises the question how far it will take the place of succulent green feed at a time like the present. Doubtless good dry lucerne, whether in meal, dust, or chaff, has some little value as a substitute for green feed, but it is probably so little as not to warrant extensive feeding of it for that purpose when the price is much above that of bran.

Preparation for Green Feed.

In many districts useful rains have fallen, and wherever the falls have been sufficient to enable the ground to be worked, no time should be lost in getting in crops for green feed. Almost any crop can be sown at this time of the year. The main thing is to get them in before the soil cools down, which it will do now very quickly.

Lucerne can, of course, be sown now as a permanent crop, but nothing can be got from it for many months to come. It is therefore necessary to sow other crops which will grow quickly and provide green feed through the winter. For this purpose there is nothing better than barley and rape.

Every poultry farm should have its lucerne plot in addition to other green fodders. Nothing will save the feed bill and provide green stuff at the same time to the same extent as will lucerne. This is becoming recognised, but there is much room for extension of this valuable fodder on the farms.

Shade.

During the heat wave conditions which have recently prevailed, there has been much discussion respecting shade in poultry yards, some blaming their losses to the absence of shade, while many whose yards can be regarded as well furnished in that respect have suffered severely.

The writer's experience is that trees, except those with a very dense growth of leaves, are almost useless during heat wave conditions, and a thick growth of scrub is worse than useless, from the fact that it prevents the free circulation of air through the yards. Then again, hot winds sweep the ground even under the trees, and, as a rule, the birds are more protected in the poultry houses and fare better when the latter are well ventilated, particularly where the doors can be opened to create a draught. As an instance of this it may be mentioned that during the most trying day, on which so many birds were lost, only three hens succumbed to the heat at the Government Stud Poultry Farm at Seven Hills, although the shade temperature was 110. At this farm there is practically no natural or other shade, except that afforded by the poultry houses themselves. Nor is this an isolated experience. The same farm has been through other tests of the same kind in past years, with a similar immunity from losses.

It may be added that, admitting the desirability of some shade, too much shade has its drawbacks, inasmuch as it keeps the yard too cold in winter time.

Good Drainage Essential for Irrigation.

Good drainage is a very necessary attribute in an irrigated soil. The water in the soil moves either downwards or upwards, according to conditions. If the drainage is good, the water will move downwards and out of the soil, taking any undesirable salts with it; otherwise the water is drawn upwards and evaporates from the surface of the soil, leaving any salts it may contain on the surface and in the surface layer, where they can do most damage.—*Journal of the Department of Agriculture*, South Africa.

Orchard Notes.

April.

W. J. ALLEN and H. BROADFOOT.

In the later districts there are many varieties of apples yet to be harvested. Growers would be well advised to give every attention to the many operations which are necessary in the marketing of fruit.

Great care should be taken in picking the fruit to avoid skin injury and bruises, as these are the starting points of decay. When picking, care should be taken to keep the stalk on the fruit. Some pickers are very careless, and a lot of unnecessary bruises are caused in pouring the fruit from the picking bag into the box.

Carting to the shed must be done with care, and travelling over rough tracks must be at a pace which will not prejudicially affect the fruit. In stacking the cases see that they are not overfilled, as a case resting on the top of an overfilled case will cause a considerable amount of bruising.

Sizing and Packing.

The advent of sizing machines has done much to assist the grower. Hand-sizing is certainly a slow, costly, and not altogether accurate way of carrying out the work. Sizing by machine is far more accurate, considerably quicker, and much more economical. Consequently every grower should aim at installing a sizing machine in his packing shed.

Before commencing to pack, see that the boards in the cases are properly nailed. Then line the case with clean white paper, cut to fit the case so that it will cover the bottom and fold over on the top after the fruit has been packed. When wrapping, see that the fruit is properly covered with the paper, and in handling apples the wrap must be finished over the stalk, so that there is no danger of the stalk protruding through the paper and puncturing the apple next to it.

The main points in packing are—use a good clean case, wrap good fruit, pack tightly, and do not finish the cases too high or too low.

It is advantageous to wire the cases, particularly those which are for export or for country orders, as in both instances cases are handled a good many times before reaching their destination. Wiring is also advisable when cases are sent to Sydney and have to be transhipped during the journey. In the case of truck lots, or of consignments which are loaded by the grower and go straight to Darling Harbour, or any other place, wiring is not so necessary, though still advisable. In stacking see that the cases are stacked on their sides and never on the bulge.

If growers attend to these matters, the fruit will sell itself, and the grade and pack will be above the criticism of even the most fastidious. Honest trading is the best policy.

Common Storage of Apples.

Many growers in New South Wales keep back each year a quantity of apples, particularly Granny Smith. This variety lends itself to ordinary storage, and usually commands prices later in the season which are in the grower's favour.

The following are some of the most important points to consider when keeping apples in common storage:—

(1) Picking at right degree of maturity.
(2) Careful handling; avoid bruising and skin abrasions.
(3) Placing the fruit in clean cases, lined with paper.
(4) Stacking the cases in a shed which is well ventilated.
(5) Arranging the stacks so that there is a free circulation of air.
(6) The fruit should be protected from vermin.
(7) Large fruit should not be stored and expected to keep as long as the small and medium sizes.
(8) It is advisable to grade the fruit for size as well as quality, and these should be kept in separate stacks. The larger fruit can easily be picked out and disposed of first, as, generally speaking, large apples do not keep so well as small and medium-sized apples.

Much fruit is wasted by growers placing fruit in heaps in sheds where it is exposed to the ravages of rats and mice, and in many instances heavy losses are incurred owing to rough handling and storing under unfavourable conditions. It would have been far more profitable if the fruit had been marketed straight from the tree.

Cultivation.

Cultivation is one of the most important operations in connection with the production of fruit, but how often is it neglected or carried out in a perfunctory manner. It is in a season like the present—dry and hot beyond the ordinary—that the effects of good cultivation are evident, and the ill-effects of poor or neglected cultivation are brought home to the grower. Undersized fruit and poor growth are the results of indifferent cultivation.

The extent of the grower's losses depends, of course, to some extent upon locality, soil, variety of fruit grown, &c., but a tour of the different fruit-growing districts reveals the fact that many otherwise fine orchards have been neglected, with consequent loss to their owners. On many of these orchards much fruit is undersized, and the trees have made poor growth and are showing signs of distress. Not only is there present loss in such cases—there is prospective loss as well. The trees have leeway to make up, and this takes time and effort and outlay. Growers who have been remiss should try to reckon up their losses. It will impress upon them that next season early and well-directed efforts should be made by thorough and judicious cultivation to keep moisture in the ground for the use of the trees. A good surface mulch, well maintained, is of incalculable value. Do not let the surface cake, and do not let the weeds grow and rob the soil of moisture which is badly needed by the trees.

There are many factors which adversely affect fruit production, but given thorough cultivation trees will stand a good deal of dry weather and develop good crops. The business-like grower realises this, and cuts his losses to a minimum by avoiding unnecessary risks. Every year he cultivates well—he has an enormous advantage over the orchardist who is careless as to his cultural work—and can calmly face conditions which spell disaster to the other.

Planting Citrus Trees.

Citrus trees may be planted in localities where autumnal frosts are unknown, provided the soil is in good, moist condition. During transfer from the nursery to the orchard, care should be taken not to expose the roots to sun or wind. All poorly developed trees should be rejected, and only those which are strong and possessed of a good root system should be planted. When planting, cut away any broken roots, and make a puddle in which to dip the roots before planting. The trees must be planted at about the same depth as when in the nursery.

Codlin Moth.

This season has been exceptionally dry and hot, and consequently very favourable to the development of codlin moth, and growers have had a busy time fighting a pest which exacts a heavy toll if adequate precautionary measures have not been taken. This season's infestation has been heavier than usual in some orchards and in some localities, but the reason has no doubt in a large measure been due to the grower allowing a heavy infestation to start from the carry-over grubs.

If a heavy infestation of moth takes place from the carry-over grubs, the grower is working at a much greater disadvantage than if, as far as possible, all sheltering grubs have been destroyed. It is these carry-over grubs that are responsible for starting the season's infestation, and more particularly in a season like the present which has very much favoured moth development.

The destruction of infected fruit is an important operation, and in seasons like this, when much windy weather has occurred, a great deal of immature infested fruit has been blown off. Unless this fruit is picked up at short intervals and destroyed, the grubs have a chance to escape. Growers are advised to do all in their power to assist in minimising the losses caused by the codlin moth—a pest which exacts a heavy toll if adequate precautionary measures are not taken. Only by combined efforts, particularly in closely-settled districts, can satisfactory results be achieved.

Woolly Aphis.

Where trees are badly infested it is advisable to give them a good spraying with tobacco wash or a nicotine extract, so soon as the fruit is picked. Any trees on which *Aphelinus mali* have been liberated, and those trees immediately round should not be sprayed.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society.	Secretary.	Date.
Gloucester A. H. and P. Association	L. J. Fox	April 14, 15
Narrabri A. and P. Association	....	,, 14, 15
Bathurst A. and P. Association	....	,, 14, 15, 16
Orange A. and P. Association	G. L. Williams	,, 20, 21, 22
Upper Manning A. and H. Association (Wingham)	C. Stewart	,, 21, 22
Clarence P. and A. Society (Grafton)	L. C. Lawson	,, 21 to 24
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 22, 23, 24
Wellington P. A. and H. Society	A. F. Rotton	,, 27, 28
Lower Clarence A. Society (Maclean)	T. B Notley	,, 28, 29
Dungog A. and H. Association	W. H Green	,, 28, 29, 30
Hawkesbury A. and P. Association	... .	,, 29 to May 1
Dubbo P. A. and H. Association	F. Weston	May 4, 5
Richmond River A. H. and P. Society (Casino)	....	,, 5, 6, 7
Coonamble P. and A. Association	....	,, 12, 13
Kyogle P. A. and H. Society	L. Campbell	,, 12, 13
Trangie P. A. and H. Association	A. K. Butter	,, 20, 21
Bonalbo A. and I. Society	W. G. E. Johnston	,, 27, 28
Peak Hill P. A. and H. Association	T. Jackson	July 27, 28
Tullamore P. and A. Association	C. S. Pryke	Aug. 4, 5
Trundle P. A. and H. Association	H E. Mullins	,, 10, 11
Condobolin P. A. H. and I. Association	....	,, 17, 18
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	,, 24, 25, 26
Bogan Gate P. and A. Association	J. Egan	,, 25
Cootamundra P. A. H. and I. Association	W. W. Brunton	,, 31, Sept 1
Grenfell P. A. H. and I. Association	T. Weneham	,, 31, ,, 1
Parkes P. A. and H. Association	L. S. Seaborn	,, 31, ,, 1
Forbes P. A. and H. Association	E. A. Austen	Sept. 7, 8
Young P. A. H. and I. Association	T. A. Tester	,, 7, 8, 9
Gunnedah P. A. and H. Association	M. C. Tweedie	,, 7, 8, 9
Lake Cargelligo P. A. H. and I. Association	J Costella	,, 8
Ganmain A. and P. Association	C. C. Henderson	,, 14, 15
West Wyalong P. A. H. and I Association	T. A. Smith	,, 14, 15
Cowra P. A. H. and I. Association	E. Todhunter	,, 14, 15
Manildra P. and A. Association	J. Longley	,, 14, 15
Northern A. Association (Singleton)	S. Griffits	,, 15 to 18
Melbourne Royal	....	,, 16 to 25
Murrumburrah P. A. H. and I. Association	W. Worner	,, 21, 22
Canowindra P. A. H. and I. Association	J Rhue	,, 21, 22
Temora P. A H. and I. Association	A D. Ness	,, 21, 22, 23
Boorowa P. A. H. and I. Association	W. Thompson	,, 22, 23
Barellan P. A. H. and I. Association	J. Doherty	,, 29
Barmedman P. A. H. and I. Association	W. Pemberthy	,, 29
Hillston P. A. H. and I. Association	J. Pevers	Oct. 1
Ardlethan P. A. H. and I. Association	R. L. Neill	,, 6
Narrandera P. and A. Association	W. H. Canton	,, 12, 13
Ariah Park P. A. H. and I. Association	J. McInness	,, 13
Carcoar, H. C. & A. Association	J. Brady	,, 13
Griffith P. A. H. and I. Association	M. E. Sellin	,, 19, 20

1927.

Central New England P. and A. Assoc. (Glen Innes)	G. A. Priest	Mar. 8, 9, 10

Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

Wheat and Oat Experiments, 1925.

Western District (Parkes Centre).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

Continuing the system of establishing experimen ' and demonstrational areas under the control of Experiment Committe .he various branches of the Agricultural Bureau and the supervision of the Agricultural Instructor, as explained in the *Agricultural Gazette* for June, 1925, page 393, fifty-eight trials relative to the growing of wheat and oats were established with forty-six farmers for 1925 harvest. The nature of the trials was similar to those established in 1924, and it is hoped that ultimately definite recommendations may be made for each centre as to varieties, cultural methods, rates of seeding and manuring.

Two series of field afternoons were held, when the group of areas under the control of each branch was visited and inspected, the details being explained by the instructor. The first series of inspections was made during August, 1925, and the second during October, when yield-judging contests were held which proved to have a markedly stimulating effect upon the faculties of observation. The large attendance at each meeting was most gratifying, and thanks are due to the lady members of the Bureau who were largely responsible for the success of the social side of these outings. The presence of the Superintendent of Agriculture, the Biologist, and the Agrostologist at several meetings was much appreciated. Commercial interests are realising that a first-hand knowledge of farming problems and seasonal conditions is of great importance to every branch of business, and the Bureau members had the pleasure of extending a welcome to many town visitors on these occasions. Twenty-two such afternoons were held, and the areas were so allocated that practically everyone in this portion of the western district had the opportunity of attending one or more gatherings.

A full report of seasonal conditions for this part of the west, together with a record of rainfall registrations, appeared in the *Agricultural Gazette* for January, 1926, page 7.

Pure Seed Wheat Areas.

The establishment of the pure seed wheat areas has been attended with marked success. The product from the areas established in 1924 was sown on fallowed land in 1925, and after the crops had been subjected to inspection,

and the seed to test by the Department of Agriculture, the graded product has been sold at 7s. 6d. per bushel in small parcels, and 7s. 3d. per bushel in parcels of twenty bags or more. A total quantity of 30,500 bushels of this standard seed wheat was made available, and all growers had sold out prior to the end of February.

Additional pure seed growers were established in 1925, and the supply of pure seed wheat should now nearly meet the demand after the harvest of 1926.

The following are the brief particulars concerning the plots for the 1925 season :—

Trundle Bureau.—Mailer Bros., "Trundle Park," Trundle; soil, red loam; sown, 24th April; seed, 46 lb.; superphosphate, 56 lb. per acre.

Gunning Gap Bureau.—V. Coombes, "Boxthorpe," Bogan Gate; soil, red loam; sown, 25th to 29th May; seed, 50 lb.; superphosphate, 58 lb.

Coradgery Bureau.—A. Millgate, "Rockvale," Parkes; soil, red loam; sown, 1st June; seed, 60 lb.; superphosphate, 65 lb.

Nelungaloo Bureau.—E. J. Johnson, "Iona," Wongalea; soil, red loam; sown, 4th June; seed, 57 lb.; superphosphate, 70 lb.

Tichborne Bureau.—W. W. Watson, "Woodbine," Tichborne; soil, sandy loam; sown, 14th May; seed, 60 lb.; superphosphate, 60 lb. high grade.

Daroobalgie Bureau.—D. Miller, "Glenlossie," Daroobalgie; soil, red loam; sown, 15th May; seed, 50 lb.; superphosphate, 48 lb.

Cookamidgera Bureau.—B. C. Adams, "Sunnyside," Cookamidgera; soil, sandy loam; sown, 9th May; seed, 60 lb.; superphosphate, 56 lb.

Moura-Reedy Creek Bureau.—A. Pearce, Mandagery; soil, loam to sandy loam; sown, 24th May; seed, 52 lb.; superphosphate 65 lb.

Pullabooka Bureau.—Hughes Bros., "Greenacres," Pullabooka; soil, red loam; sown, 23rd May; seed, 45 lb.; superphosphate, 50 lb.

Forbes (Departmental).—T. R. Jones, "Birdwood," Forbes; soil, loam; sown, 14th May; seed, 65 lb.; superphosphate, 54 lb.

Ootha (Departmental).—J. M. Connor, "Kokum," Ootha; soil, red loam; sown, 20th May; seed, 50 lb.; superphosphate, 50 lb.

Parkes (Departmental).—R. Job, "St. Elmo," Parkes; soil, light red loam; sown, 28th April; seed, 60 lb.; superphosphate, 50 lb.

Alectown (Departmental).—J. S. Plowman, "Emu Vale," Parkes; soil, chocolate to black clayey loam; sown, 21st May to 6th June; seed, 56 lb.; superphosphate, 57 lb.

Gregra (Departmental).—E. J. Allen, Gregra; soil, red loam to clayey loam; sown, 5th June; seed, 65 lb.; superphosphate, 56 lb.

Peak Hill (Departmental).—W. H. Swain, "Riverview," Peak Hill; soil, clayey loam; sown, 27th April; seed, 50 lb.; superphosphate, 50 lb.

YIELDS of Pure Seed Wheat Areas, 1925.

Variety.	Trundle Bureau.	Gunning Gap Bureau.	Coradgery Bureau.	Nelungaloo Bureau.	Tichborne Bureau.	Daroobalgie Bureau.	Cookamidgera Bureau.	Moura-Reedy Creek Bureau.	Pullabooka Bureau.	Forbes (Departmental).	Ootha (Departmental).	Parkes (Departmental).	Alectown (Departmental).	Gregra (Departmental).	Peak Hill (Departmental).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	27 0	17 43	23 15	30 31	24 15	24 0	14 6	39 15	10 36	23 14	18 30	12 18	28 16	17 4	22 30
Bena	23 0	16 3	...	29 0	27 18	...	...	38 24	15 22	...	15 20	...	28 17	...	...
Gresley	23 0	...	...	26 48	22 30	22 15	12 12	36 11	10 54		20 0	11 12	.	15 45	...
Clarendon	15 0	16 36	17 5	...	...	...	...	.	..	..	12 14	...	...	...	...
Federation	...	16 39	27 5	26 2	23 17	25 20	...	...	18 24	22 43	..	14 48	28 3	17 28	27 0
Yandilla King ...	...	...	23 48	..	21 53	24 30	15 3	39 52	10 42	26 35	...	12 18	...	17 51	...
Waratah	...	...	...	...	...	...	...	...	15 30	..	16 48	...	28 32	16 37	...
Wandilla	..	...	...	...	...	...	..	..	..	24 56	12 16	...	...	11 40	20 0
Firbank	...	...	...	...	...	...	..	.	..	...	...	...	...	.	18 0
Marshall's No. 3 .	...	...	...	...	...	...	...	.	...	...	...	...	22 22	..	...

Wheat Variety Trial.

Trundle Bureau.—Medcalf Bros., "Gillenbine," Trundle; soil, red loam to clayey loam; sown, 5th May; seed, 53 lb.; superphosphate, 55 lb.

Trundle Bureau.—R. J. O. Berryman, "Aviemore," Botfield; soil, red loam; sown, 12th June; seed, 60 lb.; superphosphate, 56 lb.

Coradgery Bureau.—W. Woods, "Rosedale," Parkes; soil, red loam to clayey loam; sown, 2nd June; seed, 65 lb.; superphosphate, 56 lb.

Nelungaloo Bureau.—G. F. Mill, "Hazelmere," Gunningbland; soil, chocolate to black clayey loam; sown, 25th to 30th May; seed, 50 lb.; superphosphate, 53 lb.

Daroobalgie Bureau.—Allen Bros., "Mayura," Forbes; soil, red loam; sown, 12th May; seed, 57 lb; superphosphate, 60 lb.

Cookamidgera Bureau.—E. D. Wilson, Mugincoble; soil, loam to sandy loam; sown, 10th June; seed, 50 lb.; superphosphate, 60 lb.

Parkes (Departmental).—J. Townsend, "Willow Vale," Parkes; soil, loam to sandy loam; seed, 56 lb.; superphosphate, 60 lb.

Peak Hill (Departmental).—J. Jelbart, Trewilga; soil, red loam; sown 12th to 15th May; seed, 60 lb.; superphosphate, 60 lb.

YIELDS of Wheat Variety Trials, 1925.

Variety.	Trundle Bureau. (Medcalf Bros.).	Trundle Bureau. (R. Berryman).	Coradgery Bureau.	Nelungaloo Bureau.	Daroobalgie Bureau.	Cookamidgera Bureau.	Parkes (Departmental).	Peak Hill (Departmental).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Canberra	21 6	...	29 26	27 55	...	8 37	...	21 3
Florence	20 0	...	...	...	...	...	...	...
Waratah	17 41	20 42	25 39	...	...	9 16	26 12	21 35
Bena	16 48	...	...	31 25	22 9	...	...	...
Clarendon ...	16 40	17 20	...	...	...	...	20 42	18 29
Redwing	15 2	...	...	...	...	...	...	...
Federation ...	12 26	...	28 13	...	...	8 19	...	19 56
Caliph	25 17	...	...	...	...	...	...	...
Turvey	...	...	25 22	27 24	...	6 24	23 10	22 28
Baroota Wonder...	...	...	23 28	...	...	...	...	...
Gresley	...	...	22 18	29 38	...	...	...	...
Yandilla King ...	...	...	...	31 0	...	...	...	18 48
Wandilla	...	...	...	28 10	21 21	9 3	...	...
Droophead Federation.	...	...	...	21 1	...	...	...	...
Gluyas Early ...	...	...	...	...	22 46	...	...	...
Minister	...	...	...	...	20 15	...	...	...
Major	...	...	...	...	...	...	...	17 32
Coles No. 8 (?) ...	...	...	...	...	...	7 48	...	...

A wheat variety trial was conducted by Mr. J. S. Plowman, "Emu Vale," Parkes, in conjunction with the pure seed wheat area. The complete results were as under:—

Variety	bus.	lb.	Variety	bus.	lb.
Ford	36	6	No. 67	25	57
4G	32	52	No. 110	24	59
No. 64	32	34	No. 4P	24	49
Waratah	28	32	No. 137	23	54
Bena	28	17	Petatz Surprise	23	26
Canberra	28	16	Marshall's No. 3	22	22
Federation	28	3	Quality	21	59
No. 4 U	27	41	No. 210	19	44
J W E	26	37			

The numbered varieties are the result of crosses and selections made by Mr. Plowman, several of which are distinctly promising, and are being now grown in commercial areas on the farm. J W E is a selection from a crop, made by Mr. J. W. Eade, of Euchareena.

Fertiliser Trials.

Each trial consisted of four plots, to one of which no manure had been applied, and to the others 40 lb., 60 lb., and 80 lb. respectively of superphosphate. They were conducted under the following circumstances:—

Trundle Bureau.—K. Gault, "Lynwood," Trundle; soil, red loam; sown 1st June; seed, 50 lb. per acre; variety, Gresley.

Gunning Gap Bureau.—W. J. Dwyer, "Daisy Park," Bogan Gate; soil, light loam; sown, 22nd May: seed, 50 lb.; variety, Gresley.

Gunning Gap Bureau—A. A. Wyatt, "Eagle Farm," Bogan Gate; soil, clayey loam; sown, 1st June; seed, 48 lb.; variety, Bald Knob.

Bogan Gate Bureau.—Walker and Ferguson "Myall Park," Bogan Gate; soil, sandy loam; sown, 2nd June; seed, 55 lb.; variety, Canberra.

Nelungaloo Bureau.—Davies Bros., "Colwyn," Brolgan; soil, black, clayey loam; sown, 13th June; seed, 50 lb.; variety, Canberra.

Tichborne Bureau.—W. Tyrrell, "Oakleigh," Tichborne; soil, sandy to red loam; sown, 12th May; seed, 60 lb.; variety, Canberra.

Daroobalgie Bureau.—W. Robinson, "Littledale," Daroobalgie; soil, red loam; sown, 8th May; seed, 56 lb.; variety, Federation.

YIELDS of Fertiliser Trials, 1925.

—	Trundle Bureau.		Gunning Gap Bureau. (W. J. Dwyer.)		Gunning Gap Bureau. (A. A. Wyatt.)		Bogan Gate Bureau.		Nelungaloo Bureau.		Tichborne Bureau.		Daroobalgie Bureau.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
No manure	16	12	17	8	16	30	Not available		27	33	22	1	16	22
Superphosphate, 40 lb. per acre.	19	42	18	20	17	24	14	42	33	18	21	12	17	13
Superphosphate, 60 lb. per acre	19	42	18	36	18	6	14	1	Not available		21	40	20	47
Superphosphate, 80 lb. per acre.	19	12	18	45	19	50	16	12	34	53	20	46	20	51

Rate of Seeding Trials.

Nelungaloo Bureau.—H. K. Nock, Nelungaloo; soil, loam; sown, 4th June; superphosphate, 62 lb.; variety, Canberra.

	bus.	lb.
Seed, 50 lb. per acre	23	54
„ 70 „	25	18

Gunning Gap Bureau.—W. Scott, "Deloraine," Bogan Gate; soil, red loam; sown, 15th May; superphosphate, 56 lb.; variety, Yandilla King.

	bus.	lb.
Seed, 45 lb. per acre	20	3
„ 60 „	22	30

Gunning Gap Bureau.—F. C. Amor, "Inchgower," Forbes; soil, loam; sown, 12th May; superphosphate, 40 lb.; variety, Bald Knob.

	bus.	lb.
Seed, 45 lb. per acre	18	0
„ 60 „	18	0
„ 75 „	17	45

Tichborne Bureau.—Wm. Tyrrell, "Oakleigh," Tichborne; soil, sandy loam to loam; sown, 12th May; superphosphate, 60 lb.; variety, Canberra.

	bus.	lb.
Seed, 45 lb. per acre	24	4
„ 55 „	23	23
„ 65 „	22	18

Crop Harrowing Trials.

Trials were conducted to test the effect of harrowing a paddock after the crop has secured a good root system and before the ground is covered.

Gunning Gap Bureau.—E. V. Hodges, Bogan Gate; soil, red loam; sown, 2nd May; seed, 45 lb.; superphosphate, 37 lb. per acre; variety, Federation.

	bus.	lb.
Crop harrowed	16	45
„ not harrowed	16	57

Tichborne Bureau.—R. M. Ashcroft, "Allengrove," Tichborne; soil, light loam; sown, 20th May; seed, 60 lb.; superphosphate, 56 lb.; variety, Turvey.

	bus.	lb.
Crop harrowed	17	48
„ not harrowed	17	30

The above results conform to the views expressed in the report concerning the 1924 trials, published in the *Agricultural Gazette* in June, 1925, page 399.

Grade of Seed Trial.

This trial was intended to determine the result of sowing second grade seeds of sound, clean quality, though smaller than first grade.

Gunning Gap Bureau.—W. Scott, "Deloraine," Bogan Gate; soil, red loam; sown, 15th May; seed, 60 lb.; superphosphate, 56 lb.; variety, Canberra.

	bus.	lb.
First grade seed	20	30
Second „	19	0

Cultivation Trials.

Several trials were conducted to determine which is the most satisfactory fallowing method.

A summer fallow is a term used where the stubble from the preceding crop was burnt soon after harvest, and the surface cultivated during February or March, followed by the winter and subsequent workings.

A cultivated fallow is used where a tine implement or disc cultivator has been substituted for the winter ploughing.

Trundle Bureau.—R. J. O. Berryman, "The Wilgas," Botfield; soil, chocolate clayey loam; sown, 8th May; seed, 60 lb.; superphosphate, 66 lb.; variety, Bald Knob.

	bus.	lb.
Summer fallowed (cultivated fallow)	17	35
,, ,, (ploughed ,,)	20	2
Winter ploughed fallow	21	34

Bogan Gate Bureau.—P. A. Sanders, Bogan Gate; soil, clayey loam to sandy loam; sown, 22nd to 30th May; seed, 50 lb.; superphosphate, 45 lb.; variety, Federation.

	bus.	lb.
Summer fallowed (cultivated fallow)	18	0
,, ,, (ploughed ,,)	20	0
Winter ploughed fallow	19	0

Gunning Gap Bureau.—S. Nock, "Ilka," Bogan Gate; soil, clayey loam; sown, 10th May; seed, 55 lb.; superphosphate, 63 lb.; variety, Bald Knob.*

	bus.	lb
Summer fallowed (cultivated fallow)	10	1
,, ,, (ploughed ,,)	11	21
Winter ploughed fallow	11	9

A trial was conducted to test a winter cultivated fallow against winter ploughed fallow.

Trundle Bureau.—K. Gault, "Lynwood," Trundle; soil, clayey loam; sown, 25th May; seed, 45 lb.; superphosphate, 45 lb. high grade; variety, Gluyas Early.

	bus.	lb.
Winter cultivated fallow	20	9
,, ploughed fallow	17	24

Various methods of working the fallow were tested at certain centres with interesting results.

* Owing to flooding and waterlogging of the soil during July and August the crop was very thin and low yielding.

Coradgery Bureau.—F. W. Giles, "Jessiefield," Parkes; soil, chocolate loam, clayey loam; sown, 29th April; seed, 60 lb.; superphosphate, 65 lb.; variety, Yandilla King.

	bus.	lb.
Summer fallowed, ploughed fallow, then worked twice ...	30	48
" " " three times	30	43

Daroobalgie Bureau.—N. Davie, Daroobalgie; soil, clayey loam; sown, 18th May; seed, 60 lb.; superphosphate, 40 lb.; variety, Gresley.*

	bus.	lb.
Winter ploughed fallow, not worked	14	25
" " worked four times ...	12	34

Gunning Gap Bureau.—P. J. O'Connell, "Innisfail," Bogan Gate; soil, loam to clayey loam; sown, 19th May; seed, 52 lb.; superphosphate, 56 lb.; variety, Bald Knob.

	bus.	lb.
Winter ploughed fallow, worked once	20	47
" " " twice	22	13
" " " three times ...	23	53

At Tichborne a trial was arranged to test the effect of a fodder crop and fallow on the wheat crop as against winter fallow only.

Tichborne Bureau.—W. W. Watson, "Woodbine," Tichborne; soil, silty light loam; sown, 15th May; seed, 60 lb.; superphosphate, 60 b. high grade; variety, Turvey.

The previous wheat crop was grown in 1923. Early in 1924 plot A was cultivated and sown to oats in April. The oats were fed off until September, when a 9-inch growth was ploughed under and the plot fallowed. Plot B was winter-ploughed in July and fallowed. The object was to determine the effect upon the wheat crop of growing a preceding catch crop of oats.

	bus.	lb.
Plot A, winter fodder and fallow	28	50
Plot B, winter ploughed and fallow	28	36

Oat Variety Trial and Pure Seed Plots.

The main purpose of these areas is to produce supplies of pure clean seed, but difficulty is being experienced in securing samples free from black oat seeds. With seed wheat the black oats are easily taken out with a grader, but with seed oats the farmer is dependent upon oat-free land. The production of seed oats is becoming an important factor in the western district, and no doubt with a little encouragement the pure seed oat growers wil soon be producing what is required.

* The heavy rains of June, 1925, waterlogged the soil, making it cold, and later, upon drying it set very hard. The worked fallow was more affected than the rougher unworked fallow.

YIELDS of Oats in Pure Seed and Variety Trials, 1925.

Variety.	Trundle Bureau.	Gunning Gap Bureau. (V. Coombs).	Gunning Gap Bureau. (W. J. Dwyer).	Coradgery Bureau.	Tichborne Bureau.	Daroobalgie Bureau.	Cookamidgera Bureau.	Pullabooka Bureau.	Forbes (Departmental). (H. Green).	Ootha (Departmental). (J. M. Connor.)	Parkes (Departmental) (J. Aitken.)	Gregra (Departmental). (E. J. Allen)
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Mulga ...	25 0	27 38	38 24	40 32	22 20	35 26	20 34	...	45 18	30 0	28 0	20 22
Myall ...	20 0	26 10	32 0	37 17	30 0	...	...	...	...	16 0	...	...
Lachlan ...	27 0	31 19	38 30	39 0	27 0	33 20	11 33	36 12	39 11	Damaged.	24 0	16 5
Algerian ...	...	...	...	...	..	...	11 1	30 0	32 18	...	22 0	20 10

Northern District.

M. H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THE following farmers co-operated with the Department in experiments with wheat during the past season:—

W. Bignall, " Arlington," Manilla.
G. Dobson, Winton-road, Tamworth.
J. G. Perry, Quirindi.
Chaffey Bros., Nemingha House, Nemingha.
Johnston Bros., Dartbrook.
W. Lye, Loomberah.
A. H. Bielefeld, Duri.
A. H. Capel, Barraba.

All the seed in the variety trial was treated with dry copper carbonate as a bunt preventive, and with good effect. Long fallow on approved lines at Duri failed to produce a grain crop, whereas a short fallow (from January) at Winton-road was sufficient for a fair crop. The most prominent varieties so far as drought-resistence was concerned were Canberra, Clarendon, Gresley, Waratah, Cargo, and Riverina. Marshall's No. 3 and Bena suffered most. Of the oats, Fulghum stood up to the dry conditions better than Belar.

Foot-rot and take-all were partly responsible for the low yields over a considerable portion of the district. The immunity of Fulghum and Belar oats to these diseases was strikingly instanced at Manilla. Cropped with wheat in 1924, portion of the land this season was sown with oats and the balance of the area again with wheat. Only in small irregular patches was the wheat free from the effect of these fungi, and a very poor crop (about 2 bushels per acre) resulted. The oats, on the other hand, as far as one could judge, were free and yielded 19 bushels per acre. The necessity for growing oats occasionally in rotation with wheat is gradually becoming recognised.

RESULTS of Wheat Variety Trials.

Variety.	Tamworth.		Manilla.		Nemingha.		Nemingha.*		Aberdeen.†		Duri.†	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Marshall's No. 3...	3	45	5	30	...		...		3	0	3	0
Cargo	14	30	7	0	...		...		...		6	0
Gresley	23	30	...		...		...		12	0	...	
Bena	17	0	7	30	19	30	20	15	...		3	0
Riverina	23	0	...		...		...		9	0	6	0
Barwang ...	...		9	0	...		...		...		...	
Waratah	...		8	0	22	15	25	30	9	0	4	0
Wandilla ...	...		...		20	15	22	15	...		...	
Canimbla... ...	..		...		18	15	19	0	...		...	
Duri	...		...		19	0	..		...		...	
Hard Federation	...		...		...		...		...		4	0
Canberra ...	28	0	...		...		...		...		5	0
Clarendon ...	...		...		...		...		6	0	...	
Cleveland ...	...		...		...		...		4	0	...	

* Manured with 60 lb. superphosphate per acre. † Estimated yield.

The New England plots were not threshed in time for yields to be included in this report.

RESULTS of Oat Variety Trials.

Variety.	Tamworth.		Manilla.		Barraba.*	
	bus.	lb.	bus.	lb.	bus.	lb.
Fulghum	26	0	19	0	9	0
Belar	20	45	19	30	......	
Mulga	......		......		6	0
Ruakura	......		.....		6	0

* Estimated yield.

RAINFALL Records.

Place.	Fallow Period.	Points.	Growing Period.	Points.
Tamworth ...	January to April, 1925 ...	626	May to October ...	640
Manilla	February to June, 1925 ...	599	July to October ...	425
Duri	September, 1924, to May, 1925	1,985	June to October ..	381
Loomberah ...	March to May, 1925	247	June to October ...	350
Nemingha ...	September, 1924, to May, 1925	...	May to October ...	337
Barraba	January to May, 1925 ...	1,027	May to October ...	435
Dartbrook ...	January to May, 1925 ...	327	June to October ...	318
Quirindi	March to June, 1925	301	July to October ...	325

Details of the Plots.

Manilla.—Situated on the low side of a long gentle slope; soil a deep free-working light red loam with water retentive subsoil. Cropped with winter fodders, manured with 56 lb. ground rock phosphate and fed off in

1921; wheat, manured with 40 lb. superphosphate, in 1922; wheat, unmanured, in 1923; Canberra wheat, unmanured (yield, 27 bushels per acre), in 1924. Stubble burned and ploughed 4 inches deep latter part of January (soil moist); springtooth-cultivated 4 inches deep first week in May (a week after rain); sown 28th May, without fertiliser in variety trial, with wheat at 53 lb. and oats at 43 lb. per acre. A good stand resulted. The crop was not fed off. By 20th October the two varieties of oats were well headed with grain in the milk stage, Belah being 2 feet and Fulghum 16 inches high. The conditions at this time were very dry, and Fulghum was showing the less effect. The oat crop was well stooled and uniform as compared with the farmer's wheat crop in the same paddock, which was showing unevenness in height and extensive patches where stooling was poor owing to foot-rot and take-all. It was a striking illustration of the virtual immunity of oats to these diseases. The wheat at this date was 15 to 18 inches high. On 5th November the oats were mature, but the wheat was still partly tinged with green, with a blighted appearance. Cargo showed the least effect. Waratah had good patches up to 18 inches high. Barwang and Bena were very blighted and tip-eared; they measured 12 to 18 inches.

The Canberra in the fertiliser trial was free of bunt and flag smut. The seed had been treated with formalin solution of standard strength, and sown shortly after treatment while still moist, a good germination and stand resulting.

Tamworth.—Gently sloping uplands; a light red, shallow, free-working soil, on clay subsoil. Cropped in 1924 to wheat (with 42 lb. superphosphate per acre). Ploughed 4 to 5 inches deep in January, harrowed in February and April; sown 2 inches deep on 27th and 28th April with springtine drill with 1 bushel of seed and 56 lb. superphosphate per acre. A good stand resulted, and the plot was fed off until 19th June by sheep. Considerable thinning out resulted, through the animals pulling up the plants, the rainfall having been insufficient to compact the soil about the roots. The loss might have been avoided by a preliminary rolling, or by driving a flock of sheep over the field before permitting the animals to feed, but in view of the light rainfall, the thin stand was possibly an advantage. The crop attained maximum growth about 14th October. At this time Riverina, Gresley, and Cargo averaged 2 feet 6 inches in height, and were well in ear; Bena was 18 inches high, with ears just peeping, and Marshall's No. 3 15 inches, ear in shot blade mostly. Fulghum oats was showing earlier maturity than Belah, and better prospects as to grain yield; both were about 2 feet high. No rain affecting the crop fell up to time of maturity (about 5th November). With the exception of Riverina, which was a little pinched, all varieties were well filled, weighty, and of good quality. Small patches of the crop were affected with take-all or foot-rot, and flag smut occurred to a slight extent in Canberra. Apart from this, neither wheat nor oats were affected by disease. Both varieties of oats made good grain and favourably impressed farmers who saw the crop.

Quirindi.—Practically level country; light red, free-working loam, partly sedimentary. Previous crop wheat, in 1924 (unmanured). Wheat has been grown on this land for a number of years; occasionally a good crop is harvested—rarely a complete failure, as in this season. The land was ploughed in mid-March 3 to 4 inches deep.

Little growth had occurred from the preceding harvest, and the rainfall had been very light. The land broke up unusually cloddy. It was spring-toothed to a depth of about 3 inches toward the end of June, destroying a mass of "stagger-weed" seedlings, and sown on 6th and 7th July with a springtine cultivator drill with 49 to 54 lb. seed per acre. This additional cultivation destroyed a further quantity of the "stagger-weed" plants and wild oats. A good stand resulted, fairly free from weed growth. On 19th October, the crop being in a wilting and stunted condition, sheep were turned on to it. Very few crops about Quirindi produced grain this season.

Nemingha.—Gently sloping uplands; soil a slightly self-mulching red loam to clay loam, overlying a clay subsoil; previous crop cotton in 1923 (unmanured), partly fed off, mown, and burned. Ploughed 4 inches deep on three occasions (September and October, 1924, and February, 1925); springtooth-cultivated March and April, 1925, harrowed later in April, and sown 9th May in a dry seed-bed with seed (treated with a proprietary copper carbonate) at the rate of 52 lb. per acre. The stand was much thinner in the unmanured section and stooling was less.

The return was considerably reduced through about a fifth of the southern end of the crop falling away in yield to 1½ bushels. The effect of drought was most pronounced on this section, and both foot-rot and take-all were in evidence. The land had been treated similarly to the other portion of the field as to cultivations. The Waratah was least affected by both drought and take-all on the poor section. Difference in stage of maturity may explain the variety's escape from the disease; otherwise it appears notably immune. All varieties were otherwise free from disease, except for infection with flag smut in Canimbla and Canberra, and one "bunty" plant in the Wandilla plot. The quality of the grain was exceptionally good. The bushel weights of varieties were as follows:—Bena, 65 lb.; Waratah, 66¾ lb.; Wandilla, 65½ lb.; Canimbla, 65¼ lb.; Duri, 62¾ lb.

Dartbrook.—Situation, uplands, slightly falling to the east; soil a red to sandy loam, about 6 inches deep, overlying a distinctive red clay subsoil of good water-holding capacity. Previous crop, oats and barley (unmanured), in 1924, harvested for hay. Hungarian millet had been grown in 1923 on the oats portion and fed off. The wheat plots were sown across the barley and oat sections of the previous year. The land was ploughed 5 inches deep in the latter part of December and early in January, 1925, with the disc plough, and springtooth-cultivated 1st April. The weeds (Bathurst burr) and self-sown oats and barley not being destroyed, the land was skim-ploughed on 7th April. From 14th to 24th April a 5-inch ploughing was given

further to destroy weeds, and the land springtooth-cultivated in the latter part of May to the depth of the ploughing. Sowing took place on 9th and 10th June in a dry seed-bed, the seed being broadcasted at the rate of 80 lb. per acre, and covered with a springtooth cultivator. No fertiliser was sown in the variety trial. Over the section which oats had occupied the previous season and Hungarian millet the season previous to that the crop was good, earing well, and promising a payable yield of grain. The portion previously occupied by barley (which portion had been pasture previously) was a failure in the variety trial, and the grower fed the lot off at the end of October. The fertiliser section was also on this portion of the paddock.

On 21st October, Gresley was 2 feet 6 inches high, with the grain in the dough stage; it had withstood the drought conditions best and stooled fairly well. Riverina was 2 feet high; it was slightly more mature than Gresley, but stooling was not so good. Cleveland was 1 to 2 feet high and in flower, and had stooled well. Waratah was a little later than Gresley; it was 1 foot to 2 feet 6 inches high, and had stooled fairly well. Clarendon had apparently suffered most from the dry conditions; the plants were mostly single stemmed, 18 inches high. Marshall's No. 3 was 1 foot high, with ears just peeping; plants of this variety also mostly single-stemmed.

Loomberah.—Upland country, sloping fairly steeply to the south; soil of gravelly and shale formation, a friable loam subject to setting, especially on the gravel formation. The subsoil is of the water-holding type, 4 to 8 inches from the surface. Previous crop, native pasture (no fertiliser applied), grazed by sheep and cattle, and classed as good fattening country. Ploughed with mouldboard plough on 18th March 3 to 4 inches deep, harrowed 2nd April; ploughed 1st and 2nd June, and the rough portions harrowed. The small section sown to oats was first ploughed on 28th May; later harrowed and ploughed a second time when the wheat section was being ploughed. The seed was sown with a tine drill cultivating to 2½ inches deep, but sowing to 1½ inches deep with wheat at the rate of 46 lb. and oats at 64 to 70 lb. per acre, both unmanured, in the variety trial. A fair stand resulted. The crop grew sturdily, and was fed off by sheep until 12th August, subsequently growing to a height of 15 inches. It came into ear early in October, the ear being small and barren on about 50 per cent. of the crop, due to dry weather. Sheep were turned on to the crop about 20th October. The sections to which superphosphate had been applied at the rate of 100 lb. and 56 lb. made more vigorous and bulky growth.

The intention had been to sow these plots on a summer-fallowed portion of land on sections of which there had been wild oats and weeds, but the autumn conditions were too dry to cause germination of the oats and weeds, and in view of the possibility of these later germinating and growing when the wheat was sown and affecting the plots this site was abandoned. The only recourse then was the freshly broken pasture land. The result again

illustrates that it is always advisable to store water in the subsoil, and to plough pasture land sufficiently early for the decomposition of the grass to be fairly complete by sowing time.

Duri.—Plots located on uplands with a slight fall towards the north-west; soil a red loam, overlying a stiffer subsoil. The land had been cropped to wheat (unmanured) in 1923; the self-sown wheat from the 1923 harvest produced good sheep feed in 1924, which growth was fed off from time to time. Ploughed 6 inches deep in August, 1924, and left in the rough. Very little growth of weeds occurred. Ploughed February 4 to 5 inches deep and the land harrowed; skim-ploughed 3 inches deep in April, harrowed after the subsequent rain, harrowed and rolled 23rd May, harrowed 30th May, and sown 1st June with drill with 42 lb. seed per acre (unmanured). The seed-bed was in splendid condition at sowing time. Moisture was slightly deficient at seed depth, but the soil was well consolidated. A thin stand resulted, and the stooling was poor, except on the sections fertilised with superphosphate at 47 lb. and 144 lb. per acre. On 16th October the grower was advised to feed the crop off quickly, as it was not too mature to respond to rain should it fall in sufficient quantity shortly after. Sheep were not turned on to the crop, however, until the latter part of October.

About one-third of the field at the south end was particularly blighted and stunted, and this, from the data available, was not due to any variation in cultivation. The rainfall and cultivation should have produced a much better result in view of other results in the district.

On a small portion of the section on which 144 lb. superphosphate per acre was applied, where water drained on from the road, the ear development suggested a yield of eight bags of wheat per acre, but the yield on the greater part of this section was estimated at three bags, that on the section treated with 47 lb. superphosphate, two bags; and the unmanured portion, one and a half bags. A rate-of-seeding trial without fertiliser was sown with Marshall's No. 3, sowings at the rate of 27 lb., 35 lb., 42 lb., and 58 lb. per acre being made. Possibly only two-thirds of the seed produced plants in any plot. The poor stooling also increased the open spaces. It was noticed that the number of wild oats increased as the rate of seeding decreased.

Barraba.—Upland country, sloping to west; soil a chocolate-coloured, deep, self-mulching basalt loam. Wheat (unmanured) had been grown on the land in 1923, producing a 20-bushel crop. The land was ploughed early in 1924, but left unsown. By December a thinly distributed crop of "Saucy Jack" covered the field. The weeds were kept under control by grazing the area with sheep. The area was ploughed 6 inches deep late in March, springtooth-cultivated on 13th April, and sown 18th and 19th May (when moisture was showing at seed depth) with the hoe drill at the rate of 42 lb. to 53 lb. per acre. A satisfactory plant-cover resulted. Little growth occurred throughout the winter, which was unusually cold; the frost caused considerable discolouration of the foliage, but none of the crop was killed. The

plots were not fed off. On 19th October Fulghum was 18 inches high, and the grain in the dough stage; this variety showed least effect from the drought conditions. Mulga was the most mature; it was 15 inches high, with the grain in the dough stage. Ruakura was a little behind Fulghum in maturity, and about 15 inches high; it made an equal showing to Mulga. Algerian was much later, with the ear just leaving the shot-blades, and of shorter growth. The variety trial was unmanured and was very patchy, some portions of the crop looking very drought-stricken, and others quite good.

The plots of Algerian treated with superphosphate at the rate of 124 lb. and 62 lb. per acre had a more uniform, higher, and earlier-matured crop. The variety was too late maturing for the dry conditions to produce grain satisfactorily, but there was four times as much green feed as on the unmanured section. This marked benefit from superphosphate indicated that had an earlier-maturing variety, such as Fulghum, been used in the test, a much greater yield than that estimated for this variety would have been obtained.

Grain Silos on the Farm.

The small grain silos that farmers are erecting on their farms in various parts of the State (chiefly northern and central-western) were referred to by Mr. E. S. Clayton, Senior Agricultural Instructor, at the Agricultural Bureau Conference at Young, their utility for the storage, especially of oats and maize as feed for stock, being strongly commended. The method aroused a good deal of attention among those who had previously heard little or nothing of it. There are several types of these silos, but mention may be made of one erected on the farm of Mr. W. W. Watson at Tichborne, near Parkes. It consists simply of galvanised iron, which, with the other necessary materials, cost £22 10s. landed on the farm. The silo, which was erected with farm labour only, was placed on a pine stand a foot or two above ground level. Fifteen months ago 300 bags of Sunrise oats were stored in it in bulk, and to-day they are still there in perfect condition—a valuable security against shortage of feed.

The possibilities of this method were referred to by Mr. J. T. Pridham, Plant Breeder, in the *Gazette* of September, 1922, (p. 615).

The Problem of the Unavoidable Surplus.

What can be done toward handling unavoidable surpluses which are so disastrous to a stablished agriculture when they occur unavoidably? This is one of the major economic problems of the nation. It is well known that small surpluses exercise a depressing effect on prices altogether disproportionate to their amount. Measures to regulate the movement of surpluses into consumption, so that unnecessary price fluctuations can be avoided and speculative hazards lessened, are urgently needed.—Report of the Secretary of Agriculture, Washington, U.S.A.

Improving the Farm Draught Horse.

A Practical Example.

E. S. CLAYTON, H.D.A., Agricultural Instructor.

A MOVEMENT is now on foot to improve the standard and increase the efficiency of the draught horses used in the wheat districts of New South Wales. The Coolamon Agricultural and Pastoral Association has taken the matter up, and last season rendered valuable assistance to its members by securing the services of an exceptionally well-bred Clydesdale horse. The association made an agreement with Messrs. F. S. Falkiner and Son, "Widgiewa," for the use of their Clydesdale horse "Benmore." The association guaranteed fifty mares at 5 guineas each, and managed the horse. The owners paid for the groom, horse feed, and other incidental expenses, and took all risk. The association got a rebate of 20 per cent. for all over fifty mares, which more than paid for any time devoted to management. The expenses of the association were nil.

Within a week of the list being opened, ninety-eight applications had been received, and an attempt was therefore made to secure an additional horse, viz., "Widgiewa Ian," but Messrs. Falkiner and Son preferred to confine the agreement for the season to one horse. Farmers were limited to two mares, and only seventy-five mares were accepted for the season. Quite a number of farmers joined the association for the sole purpose of securing the services of this horse. At the end of the season the horse was returned to "Widgiewa," and Messrs. Falkiner and Son thanked the association for the care they had taken, and expressed satisfaction at the condition of the horse.

By undertaking this work of providing the services of a well-bred stallion for the use of members and at a reasonable fee, the association has certainly shown itself to be alive to the needs of the day, and it is anticipated that if the policy is persevered with the standard of the horses of the district will rapidly improve.

The Coolamon farmers, realising the necessity for agricultural education, recently arranged a trip to the Wimmera district, in Victoria, where much valuable information regarding wheat-growing was obtained. The present movement to improve the horses of the district is one of the results of that trip, for many evenly-matched, well-bred Clydesdale teams were seen working in every portion of the Wimmera district.

The fact that five stud mares were purchased at the last Melbourne Show by Coolamon farmers is further evidence of the interest taken in horse improvement in that district. Now that agricultural societies throughout the State are paying more attention to the educational aspect of their activities, this experience of the Coolamon Association is quoted in the hope that its practical step towards horse improvement will be followed by other societies.

Lucerne and Sheep in Combination.

A Lachlan River Farm.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

A farm of 485 acres which carries 1,600 to 2,500 sheep, produces a substantial surplus of lucerne hay and chaff for sale, and markets several kinds of fruits from an orchard of 52 acres, is a fairly diversified proposition and a productive one. Such a property is situated on the rich, alluvial flats that border the Lachlan to the south-east of Forbes. Almost every acre of it can be irrigated from the river by means of a pumping plant that will lift 4,500 gallons per minute, and a system of open channels and drains 9 miles in length. The owner is Mr. D. J. A. Nicolas, who has devoted himself to the improvement of the property and its equipment until production must almost have reached the maximum and labour charges the minimum.

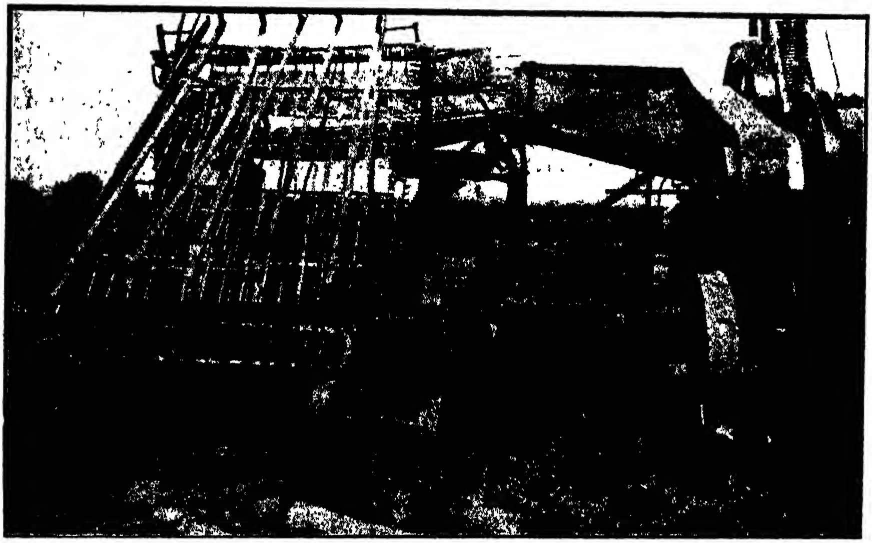
About 100 acres are reserved as grass paddocks for the sheep and horses, and 300 acres are under lucerne, from which five or six cuts are obtained each season. The lucerne is extensively utilised for the feeding of the sheep, as hay and also as grazing. The practice in connection with the grazing is to turn the sheep on to the ground so soon as a crop of lucerne has been cut, so that they may clean up everything left behind and feed down any growth left on the borders, drains, and check banks. Immediately after the ground is cleared up the sheep are removed, and the land is flooded in view of the next cut.

The number of sheep on the farm fluctuates somewhat in relation to the price of lucerne hay and chaff. The flocks are increased when the price is low so that the feed may be marketed "on the hoof," and when the price of fodder rises during one of those dry spells that occur in the west, the sheep are reduced in number to allow of more hay and chaff being marketed. Last year, for instance, 2,500 sheep were shorn, but early in the present year, fodder being more valuable, the number had been reduced to 1,000 ewes with 600 lambs. What can be done in the way of intensive production could hardly be better exemplified.

Many people do not like grazing stock on lucerne on account of the risk of hoven, but at "Champsaur" they are on it summer and winter, and the losses are very small; the chief precaution necessary being that empty sheep must not be turned into a luscious growth and allowed to fill themselves. One or two small paddocks with somewhat old and thin stands of lucerne are used for grazing in addition to the grass paddocks, so that the sheep are practically never without the flavour of the "king of fodders."

A few acres of rougher fodder are also grown, Sudan grass being favoured. In the past season about 12 acres were under Sudan, and a couple of acres under sorghum. Compared with lucerne these crops seem rather

poor feed, but they are decidedly useful. Mr. Nicolas's experience with a crop of Sudan in the year 1920 would be an encouragement to any farmer to have a few acres every season. On 1st November, 1919, 21 acres were sown with 5 lb. of Sudan seed per acre, and to germinate the seed the block was irrigated at once. At the first cut on 15th December it was 9 feet high, though only forty-five days from sowing. A second cut, 8 feet high, was obtained on 26th January, 1920, and a third cut nearly as good was taken off early in March. From the middle of December till May 1,650 sheep were almost exclusively fed on that Sudan grass, the crop being cut and fed daily. It might be remarked that such handling hardly makes the best use of the crop, as the stalks become harsh when allowed to grow so tall.



The Combined Hay-loader and Derrick Press.

Front view. Note the revolving teeth which pick up the hay, and the tapes or ropes by which it is carried to the press.

A better method is to fence the crop off in small blocks and to graze these in rotation. With irrigation three grazings could easily be obtained from each section, and the feed would be of fine, succulent quality.

An orchard of 52 acres produces a variety of fruits—apples, pears, peaches, plums, almonds, quinces, oranges, and so forth. In December, 1924, during five days of Christmas week, 21 tons of peaches were forwarded to Sydney, and for New Year week, 1925, the forwardings reached 17 tons; but the returns were not profitable and confirmed Mr. Nicholas in the conversion of the greater portion of his orchard to citrus. This change over to citrus has been going on for some years, it having been found that central-western towns offer attractive markets for that class of fruit.

The pumping plant that lifts the water from the river to irrigate this little farm of varied products was formerly operated by an ordinary boiler at a cost of £2 daily for fuel, but a year or two ago a suction gas engine

of 120-horse power was installed; the daily cost of which for fuel is only 11s., while the area irrigated per day is now 6 to 7 acres as against 3 acres with the old plant.

Novel Labour-saving Devices.

Perhaps the most prominent feature is the ingenious devices that have been adopted to economise labour in the harvesting of lucerne hay. Time was when, by the use of the ordinary mower, side-delivery rake, and hay-loader, the crop was loaded on to a waggon and drawn to a machine press to be baled, or to a stack to be pressed and baled in the ordinary way. At that time eleven men worked 100 acres of lucerne. To-day nine men handle

The Combined Hay-loader and Derrick Press.
Side and rear view. Note the hay being fed from the canvas platform into the press where it is baled while the whole machine is in motion.

300 acres, and probably with less effort. The change has been brought about by the application of ingenuity of a quite remarkable order, enabling economies of movement at three different stages, which for convenience may be stated thus:

(1) By cutting the crop and leaving it in a reduced number of windrows on the field so that the hay-loader can pick up the hay in just half the usual number of trips.

(2) By lifting the hay and baling it practically in one operation, while the combined machine is moving round the field.

(3) By loading the bales on to a waggon so that manual lifting is altogether eliminated.

The business of making, harvesting, baling, and stacking lucerne hay has thus been reduced to what appears to be bedrock.

Taking these three important labour-savers one by one, the mower may be mentioned first. Instead of the side-delivery mower (once used on the farm, and still the implement employed by many growers), Mr. Nicolas has returned to the old ordinary mower, but he has attached, first, a horizontal travelling platform which carries the lucerne as it falls from the knives and deposits it at the right side, while, second, an extension delivery has been attached which can be brought into operation at will and which will drop the lucerne 4 feet to the right. The effect of these attachments is that one cut can be deposited on top of the previous one. The advantage of the arrangement is obvious. It means the lucerne lies on the field in half the usual number of windrows, so that whether rake or hay-loader is used to lift the crop only half the number of trips have to be made to do so. Two mowers have been equipped with this novel side-delivery; so that while one, taking the first cut, drops its lucerne in a narrow swathe in much the ordinary way, the other, with the extension in gear, carries the second cut to the right and drops it loosely on top of the first. Under the dry conditions that obtain at Forbes, the windrows do not require to be turned, and the hay is ready to be loaded in 24 to 30 hours. Under conditions where the drying would be slower than at Forbes, it would be desirable to place less material in the windrows, and the extension delivery may readily be adjusted so that the second cut will be placed, not on top, but a little to the side of the first cut, and yet near enough for the hay-lifter to pick up both rows at once.

This brings us to the second, and perhaps the most ambitious device in operation on the farm. It consists of a hay-rake or hay-lifter combined with a power-driven derrick press. This combined machine picks up the hay, presses it into the ordinary 90-lb. bale, and drops it behind. The hay is picked up by means of revolving rakes or teeth—somewhat as an ordinary hay-loader—and is carried upward and backward by means of travelling ropes or tapes to a travelling canvas, by which it is carried to the left to the hopper of an ordinary derrick press. The whole plant—hay-lifter and derrick press—is firmly braced together into one rigid piece of machinery, which is drawn by five horses. The hay-lifter itself is operated from the main wheels (really the driving wheels of an old machine, which have been brought into this new service), while the derrick press is power-operated in the usual way.

Moving over the field, this large combined machine (driven by one man) picks up the hay, carries it in a steady stream to where one man is feeding the press and two are wiring the bales, and, finally, drops the bales behind ready for the stack or the market.

The machine picks up the hay as cleanly as any rake, reduces the amount of handling so that no leaf or flower is lost, and effects appreciable savings in labour. No side delivery hay-rake, no loading of hay on to a waggon, no carting to a stationary press! Last year 5 to 6 tons were pressed daily with five men on the stationary press, but this year 10 to 12 tons are being handled per day per medium of the combined machine worked by four men—one driving, one feeding the press, and two tying the bales.

On 5th March of the present year, in a crop cutting 1 ton per acre, the combined machine with four men in four hours lifted from the windrows and pressed 256 bales, aggregating 9½ tons. Mr. Nicolas estimates that in the ordinary way it would have taken five men to work the press, &c., and in that time they would not have handled more than 3 tons to 3½ tons. The machine, which was not an expensive one to make, can be easily attached to any travelling lucerne press, and may be used to lift windrows made with an ordinary hay-rake.

The last labour-saving appliance on this highly organized farm is a bale loader, which is attached to the rear of the ordinary waggon. When the bales that have been dropped by the press are to be drawn to the stacks, the waggon, with bale-loader attached behind, pulls alongside, and the bales, one by one, are tilted on to an endless chain which travels round a ladder, carrying them up and tipping them on to the waggon. This elevator is mounted on its own wheels, from one of which the power is derived for the operation of the endless chain. As the waggon moves forward, the movement of the attached elevator sets the endless chain in motion, and the bale is caught on wooden blocks and spikes which lift it on to the waggon, where it is put into position by manual labour.

The saving effected by this simple piece of machinery has been most appreciable. In one case, on a trial, 90 bales were put on the waggon in twenty-five minutes and stacked within the hour. The average size of the stack is 80 tons, fifteen bales high.

The savings in time and labour effected by the mechanical devices thus briefly described have been most substantial. The ideas have been chiefly suggested and developed by Mr. Jean Nicolas, and from the point of view of the Department and of other farmers are valuable as indicating the many ways in which ingenuity may serve farm problems.

Adequate Feeding always Pays.

The greater the portion of total feed consumed by the dairy cow available for production the greater the gross value of every ton consumed. A 150-lb. butter fat cow consumes 15 tons of grass, returning 15s. per ton, with butter-fat at 1s. 6d. per pound; a 300-lb. cow consumes 20 tons, returning 30s. per ton. Adequate feeding always pays.—*New Zealand Journal of Agriculture*

Increasing Area Under Lucerne in North America.

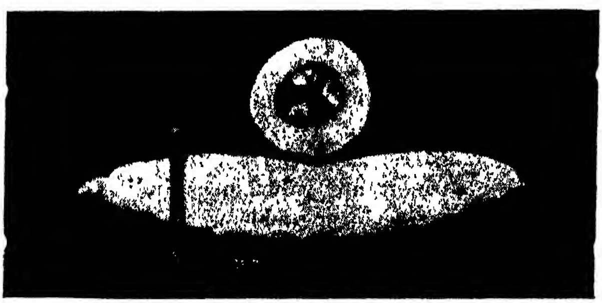
In 1909 the acreage under lucerne in Canada was less than it then was in England. In 1925 Canada grew 400,000 acres and England grew only 54,000 acres. In the United States, last year, 10,500,000 acres were under lucerne compared with 2,000,000 twenty-five years ago.—*Farmers' Express*, London.

The Banana Squash.

J. DOUGLASS, Agricultural Instructor.

SEED of this vegetable—a type of cucurbit imported from America—was recently made available to the Department for testing under local conditions. The seed was tried in the Miranda district, and, considering that the spring and early summer had been dry and that the soil in this district is of a sandy nature, excellent results were obtained.

The seed was planted during the second week of September in hills which had been previously dressed with poultry manure. The hills were watered occasionally, but not regularly. The vines soon began to run, and in a short time had covered the ground between the hills. The top vegetable growth is very similar to that of the pumpkin, the only noticeable difference being in the size of the leaves, those of the squash being much smaller. This, however, may have been partly caused by the dry weather experienced. Some fruit had set in the very early stages of growth, and had attained a good size in about eight weeks. When fully matured it is usually about 2 feet in length and about 9 inches through at its widest diameter; the average weight is about 10 lb. Both ends are pointed and the fruit has a slight curve as in the banana, from which it derives its name. The skin when mature is hard like that of a pumpkin and french-grey in colour. The mature squash has a very dark yellow flesh, which is slightly thicker than that of an ordinary vegetable marrow. The seed is carried in three distinct clusters along the whole length of the fruit. At nine weeks the vegetable was not mature, but had a good yellow flesh of excellent quality and flavour. At ten to twelve weeks the flesh is deep yellow, and when cooked it is dry in texture and has a sweet and attractive flavour. The keeping quality of this vegetable has not been ascertained, although the hard skin and dry cooking quality are usually associated with good keepers. The squash where cut keeps better than vegetable marrow, which is a distinct advantage to the housewife.



The Banana Squash.

Judging by the results obtained this year, the banana squash should be a fair yielder. This vegetable should become very popular as it is ready to cut very early, and can be placed on the market before pumpkins and the better class of squashes. Early squashes usually have a very poor flavour and colour. In the writer's opinion the banana squash has the most delicate flavour of all squashes, marrows, or pumpkins.

Field Experiments with Wheat.

Variety Trials at Cowra Experiment Farm.

J. A. O'REILLY, H.D.A., Experimentalist.

Variety trials with wheat for hay and grain (both early and late sowings) are conducted at this farm every season with the object of determining the most suitable varieties for the district, and to test new and imported kinds against those already in use. By means of these trials the least productive varieties are eliminated, and the distribution of high-yielding strains throughout the State must stimulate increased production. If after three years a new variety proves favourable, larger areas are sown the following season to produce sufficient seed for distribution.

For the season just closed the land was prepared as follows:—Ploughed, 11th July, 1924; springtoothed, 29th July, 1924; sundercut, 22nd August, 1924; skim-ploughed, 21st November, 1924; mouldboard ploughed, 7th January, 1925; rigid-tine cultivator, 16th February, 1925; springtoothed, 18th February, 1925, and 18th March, 1925; rigid-tine cultivator, 23rd March, 1925, and harrowed, 27th April, 1925. The seed-bed was in good order and the seed covered well.

The rainfall on the fallow was as follows:—July, 1924, 177 points; August, 213; September, 546; October, 224; November, 56; December, 95; January, 1925, 33; February, 204; March, 130; April, 46; total, 2534 points.

The rainfall for the growing period is shown in the table hereunder:—

Month.	Early Sowing.		Late Sowing.	
	Grain.	Hay.	Grain.	Hay.
	points.	points.	points.	points.
May	283	283	...	...
June	791	791	791	791
July	154	154	154	154
August	131	131	131	131
September	74	74	74	74
October	185	185	185	185
November	431	...	431	...
Totals	2,049	1,618	1,766	1,335

The precipitation during the fallowing period was heavy, especially in November, 1924, and January, 1925, which occasioned considerable inconvenience at harvest time, but had the effect of thoroughly saturating the

subsoil. The supply of moisture in the soil at the time of planting enabled the early-sown varieties to develop a vigorous root system, which stood them in good stead during the dry spell in September and October. The later-sown varieties benefited more by the rains which fell during the latter end of October and November. The early varieties were filling well prior to these rains, and eventually a good plump sample of grain was harvested.

Disease was prevalent throughout the district and flag smut, loose smut, and foot rot were in evidence in the trials. Little or no rust was noticeable. As a result of the previous treatment of seed with copper carbonate, bunt did not appear.

The Early Sown Grain Section.

These plots were sown on 28th April, 1925, at the rate of 42 lb. of graded and treated seed per acre; superphosphate at rate of 60 lb. per acre was used. All plots germinated well and were not seriously affected by the heavy rains in June. Bena, Ford, Bredbo, Onas, and Canimbla did especially well, yielding over 40 bushels per acre. Hard Federation, which was used on the checks, did not yield as well as the above-mentioned varieties, but taken year in and year out yields consistently well throughout the district. Booral, Brandon, and Baldry have been eliminated on account of the unsatisfactory yield obtained from them. Harvesting was carried out with the header on 30th November, 1925.

It may be explained that the trials are conducted in triplicate, with the object of securing absolutely reliable comparisons. In the following tables the average only of the triplicate plots is given in each case. The averages for each variety obtained on the farm since 1922 are also given, to enable further comparisons to be made.

Variety.	Averages of Triplicate Plots, 1925.	Averages since 1922.
	bus. lb.	Bus. lb.
Ford	47 31	47 31‡
Canimbla	46 36	43 50†
Onas	46 31	41 21†
Bena	45 54	46 36†
Cadia	42 52	41 48†
Bredbo	41 9	41 9‡
Wandilla	38 28	42 27†
Bandon	38 25	34 11†
Booral	36 12	39 42*
Hard Federation	34 58	35 32†
Baldry	31 2	37 47†

* 2 years. † 4 years. ‡ 1 year.

Early Sown Hay Section.

These plots were sown on the 27th April, 1925, at the rate of 42 lb. of graded and treated seed per acre; superphosphate, 60 lb. per acre. Waratah

and Canimbla proved the best in this trial. Barwang, which did not yield up to expectations, will be omitted from future trials. Harvesting was carried out on 12th November, 1925.

Variety.	Averages of Triplicate Plots, 1925.			Averages since 1922.		
	t.	c.	q.	t.	c.	q.
Waratah...	3	12	2	4	10	0‡
Canimbla	3	9	3	4	6	0†
Yandilla King	3	3	0	3	13	2*
Wandilla	3	1	1	3	18	1†
Barwang	2	17	3	3	10	3†

* 2 years. † 4 years. 3 years.

The Late Sown Grain Section.

The trial was sown on 2nd June, 1925, at the rate of 52 lb. of graded and treated seed per acre; superphosphate, 60 lb. per acre. Germination was good, but the plots were washed a good deal by the rains in June. Some of the new varieties, such as Bobin, Boolaroo, and Duri, showed great promise. Harvesting with the header took place on 10th December, 1925.

Variety.	Averages of Triplicate Plots, 1925.		Averages since 1922.	
	bus.	lb.	bus.	lb.
Bobin	31	16	31	16‡
Bald Early	29	38	29	38‡
Boolaroo	29	31	29	31‡
Waratah...	29	24	40	29†
Boonoo	28	28	38	33*
Hard Federation	28	13	36	54†
Duri	27	53	37	51*
Bandon	27	53	35	18†
Bena	27	39	39	6†
Ford	26	29	26	29‡
Booral	26	1	26	1‡
Baldry	23	1	35	7†

* 3 years. † 4 years. ‡ 1 year.

The Late Sown Hay Section.

Sowing took place on 28th May, 1925, at the rate of 52 lb. of graded and treated seed per acre; superphosphate, 60 lb. Firbank was used as checks. Waratah proved to be superior to the other varieties in the trial. Barwang and Firbank were low on the list. Usually these varieties are not grown for

hay in the district and are rarely cut for hay, except in the case of a very dry year, when they might be utilised for hay purposes to avoid total loss. Harvesting took place on 12th November, 1925.

Variety.	Averages of Triplicate Plots, 1925.			Averages since 1922.		
	t.	c.	q.	t.	c.	q.
Waratah...	2	8	2	3	3	1*
Clarendon	2	6	0	3	1	2*
Barwang	2	5	0	3	3	0*
Gresley	2	4	3	2	9	3*
Firbank	1	19	3	2	12	1*

* 4 year.

Notes on Varieties.

Gresley (Federation x Huguenot).—A West Australian production of mid-season to early maturity; a splendid hay variety, also suitable for grain purposes in this district.

Hard Federation (a selection from Federation).—A grain variety suitable for midseason and late planting in this district. Comparatively, it yielded better sown late than early this year.

Wandilla (Federation x Yandilla King).—A dual purpose variety, which has yielded consistently well for grain; shows a good deal of resistance to flag smut.

Yandilla King (Yandilla x Silver King).—A dual purpose variety, suitable for early planting, slightly later and taller in the straw than Wandilla. A South Australian production.

Canimbla (Hard Federation x Cleveland).—A late-maturing, heavy yielding variety for hay and grain. It is perhaps too late for this district; would be well suited to the later tableland districts.

Waratah (Hudson's Early Purple Straw x Gluyas Early).—A very useful variety, suitable to a large area of the wheat belt of New South Wales; suitable for midseason and late planting. It is a good grain yielder; owing to its straw being of a semi-solid nature, high yields of hay are obtained from it. Waratah is a Departmental production.

Barwang (selection from Hard Federation).—A suitable hay variety, but has not yielded satisfactorily on the farm, consequently it will be omitted from the trials in the future.

Bena (selection from Hard Federation).—A natural cross with Marshall's No. 3; has yielded consistently for grain in early and late trials. It can be safely recommended for this district.

Baldry (Hard Federation by Bald Knob).—Has not yielded up to expectations, and will not be included in further trials.

Cadia.—A grain variety slightly later than Canimbla. Being a Cleveland cross, it will be more suitable to the tableland district. It can be recommended for grain purposes.

Onas (Parragon x Federation).—A useful grain variety from South Australia; has given satisfactory results for grain in the early-sown trials.

Bandon (Hard Federation x Yandilla King).—Has not proved satisfactory, and will not be included in further trials.

Ford (promising variety from South Australia).—Dual purpose, suitable for early sowing. Yielded very well last year, but in a good season might possible grow too much straw.

Bredbo (promising strain from Hard Federation and Marshall's No. 3).—A later maturer and better stooler than Bena. Worthy of further trial.

Firbank.—An early maturing hay variety, suitable in districts with short growing seasons.

Clarendon.—An early maturing variety. Better stooler than Firbank. Suitable for grain purposes in early districts.

Boonoo (Steinwedel x Yandilla King x Zaff).—A promising crossbred suitable for grain purposes for mid-season and late planting. A Departmental production.

Duri (closely related to Canberra).—Whether it is a better variety than Canberra should be proved by future trials.

Bald Early (selection from Steinwedel).—Suitable for late sowing. Yielded very well for grain last year, and is worthy of further trial. It originated in Victoria.

Boolaroo (from Hard Federation x Clarendon).—A crossbred which promises well for grain. Suitable for late sowing.

Bobin (Thew x Steinwedel).—A very promising crossbred. Yielded well in late sowings last year. Worthy of further trial.

Destruction of Snails by Copper Sulphate.

The Stock Branch has for some years advised stockowners that snails, which might be the intermediate host of the liver fluke of sheep, could be destroyed by the use of copper sulphate. The Chief Veterinary Surgeon, Mr. Max Henry, lately received a letter from a grazier in the Monaro district from which we extract the following:—"I have been using this method of destroying the snail, and find it very effective. As it is mostly in running water in small creeks and drains, I have been using it very much stronger than the above (one to one million parts of water). In a hole in the creek where I estimated there was from 3,000 to 4,000 gallons of water I put about ¼ lb. of bluestone into a piece of bagging and tied it to a light pole, and then swirled it through the water until it dissolved. A week afterwards I could see the grey dead shells of the snails all through the water-hole. Other places where there would be just a small run of water, I would drop the bluestone in, and then come back a little later when it had mostly dissolved and stir the water up. I find it necessary, as you mention, to repeat in two or three months, as the eggs hatch out and a fresh batch of small snails appears. Although I have been using the sulphate of copper fairly strong in the running water, I have had no ill-effects with the stock."

Mixed Farming and Fat Lamb Raising.

J. CLATWORTHY, "Beechmore," Goonumbla.*

THIS paper will follow much the same lines as those read at the Western District Conferences held at Parkes in 1924 and 1925; the short interval does not allow of presentation of a new set of methods, but only of the additional experience gained. It will be for delegates to determine how far their local conditions will allow them to follow or improve upon the recommendations, it being understood that Parkes district is typical of the drier and more extensive area of the wheat belt.

More Crops, More Sheep.

It is accepted that a flock of sheep is essential to the greatest returns from the farm, so there is the stock-raising side to be considered, in addition to rotation of crops and conservation of fodder. It is acknowledged that good farming has spread from the south, so it is idle for a westerner to talk to you on the subject of fallowing, but being an essential part of farm practice, the method must be mentioned. The point has been reached when a number of the most progressive farmers in our district sow only on fallow.

Up to five years ago, my opinion was that from the stock-raising point of view the land could not be spared for fallowing. Now, the all-fallow stage has nearly been reached, and I find with the rotation crop of oats, more sheep are being carried; in fact, I estimate each acre of oats means the carrying of an additional ewe.

Some critics are concerned at the wheat acreage being stationary, but keen practical men are more concerned with the yield than with the acreage, and their motto is increased production per acre rather than increased area. Mr. W. W. Watson, Tichborne, near Parkes, has proved that this can be accomplished; his yields from fallow for twenty-three years averaged 20½ bushels, and with improved methods of working his average for the last six years has increased to 25½ bushels. Fallowing also spreads the work more evenly, and thus avoids the usual autumn rush, and it provides land that is easily worked for the succeeding oat crop. Any system of rotation is dependent on the size of the farm, but I submit the following three as worthy of consideration.

(*a*) 4-year rotation, wheat, oats, grazing, fallow.
(*b*) 3-year rotation, wheat, oats, fallow.
(*c*) 2-year rotation, wheat, oats and fallow.

The advantages of these systems may be stated as follows :—

(*a*) This system of rotation ensures a heavy crop of wheat and oats, and following the two applications of superphosphate, a rich grazing period.

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* Paper read at Agricultural Bureau Conference at Young on 10th March, 1926.

(*b*) This is suitable for the average farm, and allows for good yields, but a shorter grazing period.

(*c*) This rotation is especially suited to the small farmer who desires to obtain maximum returns from wheat, to have a clean farm, and to carry a small flock of breeding ewes.

The wheat period in the last case would extend from May to December, the grazing of the stubble would cover another two months, and following a "burn" the oats would be sown in March and grazed until July or August, when fallowing would commence. By that time the oats would be well ahead of the sheep, and the ploughing under of the sheep manure and green oats would supply humus to the soil, and thus correct the deficiency that is so adversely affecting farms where bare fallow is consistently practised. It is assumed that the farm has one small grass paddock which will carry the sheep between the intervals. Usually the wheat crop allows of some grazing, but it is a matter requiring care and judgment, the essentials being quick feeding off and avoidance of late feeding off.

Rotation Crop of Oats.

It is pleasing to observe a considerable extension of oat-growing in the Parkes district, areas of 200 acres being now quite common. The ex-fallow allows of the cultivation of the oat crop at a minimum of expense. Usually one stroke of the combine is sufficient (the stubble having been burnt), and the cost would work out as follows:—

Combine, 3s. per acre; superphosphate, 3s.; seed, 1 bushel, 4s.; total, 10s. per acre.

Should it be necessary to use a one-way disc or sundercut, it would mean an additional cost of 4s. per acre. The planting should be completed in March or early April, so as not to interfere with the wheat operations, and following rain there will be grazing until July, when, if the whole area or portion is not required for further grazing or later for topping-off lambs, there will usually be sufficient growth for fodder conservation.

Suitable Varieties.

The handling of silage, hay, and grain will be completed before the wheat-stripping commences, so the two operations of sowing and harvesting the oats will be sandwiched between the wheat cultural operations. The quick-growing varieties, Mulga and Sunrise, are very suitable for grazing, silage, and hay, and Lachlan for grazing and grain. The old variety, Algerian, is not a success locally unless there are early autumn rains, though I consider it still holds pride of place for quality of hay. It is well known that healthier, more vigorous and heavier-yielding crops of wheat follow the oat rotation.

On "Beechmore" for the season 1920–21 the wheat was sown on fallow with two areas of 30 acres of oats; the yield of wheat was 27 bushels, with heavy yields of oats for grain and hay. Following an early burn of the stubble, the ground was worked with a "one-way," and the whole area

sown with wheat. The area averaged 18 bushels, but on the portions previously cropped with oats the yields were 27 and 30 bushels per acre, an appreciable increased yield. As an instance of grazing value, last April a 40-acre paddock was sown with Lachlan oats (superphosphate 60 lb.), and 200 sheep were grazed from June to the end of November, being taken out at intervals owing to heavy rains. At one period during September, 600 sheep were in the paddock.

Fungous Diseases.

Regarding fungous diseases, I cannot do better than quote from a speech delivered at last Sydney Show by Dr. R. J. Noble, Principal Assistant Biologist, Department of Agriculture, when he stated that between two million and three million bushels of wheat were lost in New South Wales during the season 1924–25 owing to plant diseases. Dr. Noble stressed the value of the burning of stubble and fallowing to help to kill out flag smut, take-all, and foot rot. Oats were immune to these diseases, and in many cases could be profitably grown for grazing or for fodder purposes. Barley is subject to the same diseases as wheat, and I do not advocate the planting of extensive areas on the wheat farm.

In June last, when the Bogan was actually in flood, a paddock of oats and Skinless barleys was covered with water for some little time. The oats were not affected, but the barley had every known flag disease, and I think some that are unknown.

Value of Oats.

The value of oats as a grain food came as a surprise to many when a Departmental report was published showing the results obtained from feeding oats to ewes with lambs at foot at Bathurst Experiment Farm. As compared with maize, oats showed a considerable profit. I cannot do better than quote my last year's summing-up of the value of oats as a rotation crop :—

(*a*) The growing of healthier wheat crops with resultant heavier yields and greater profit to the grower.

(*b*) Reduction of the loss from fungous diseases.

(*c*) Increased fertility of the land, especially if superphosphate is used, with added farm value.

(*d*) The breeding and fattening of greater numbers of fat lambs, yielding a considerably increased profit to the farmer.

(*e*) An inexpensive source of supply for the conservation of fodder, either for the farmer's own use or for sale during periods of drought.

Conservation of Fodder.

The present is an opportune time to stress the great importance and the urgency of the conservation of fodder. It looks as if the pendulum is swinging towards drier seasons; the country is fully stocked, and there is less fodder stored than usual to face a drought period. The lucerne districts are, of course, doing their share, but through the extensive wheat belt, farmers have not yet realised the immense possibilities that could be utilised to build up

reserves to supply their own needs and those of graziers. It is most unfortunate that there is no scheme of finance to enable the average farmer to build up reserves. Once again I must refer to the rotation crops of oats, which provide the needful, cheaply produced, to allow of these reserves being built up.

Silage.—Dealing first with silage, the Department of Agriculture has several most excellent publications, with complete instructions for the making of silage. I would only like to stress the value of small silos, of 50 to 100 tons capacity, and the importance of the quality of the material used. It cannot be expected that poor quality material put into the pit will come out prime and equal in feeding value to oats or barley which were cut at the right stage and with plenty of sap.

Hay.—In all the articles published, the cost of production of silage is given, but in the case of hay the selling value is given for purposes of comparison instead of the cost of production. I must confess to being an enthusiastic advocate of the value of oaten hay for feeding purposes, having obtained most satisfactory results during dry periods. The only trouble in the past was that there was not sufficient for all needs, it being usual to find when the stacks were opened that serious damage had been occasioned by mice and weather; of late years the mice seem to be an annual visitation. One has only to consider the quantity of grass daily consumed by a sheep to realise that when natural pastures are depleted the animal cannot accommodate itself to a small allowance of grain or concentrated foods, but with an allowance of bulk food, such as hay or silage added, most excellent results are obtained.

Having last year purchased a tractor for farm use, I was able to provide the power necessary for a hay press, and I was enabled to realise my ambitions, namely, to press my own hay. It would not be an exaggeration to state that, of the hay conserved in our district during 1924-5, at least half has been damaged by mice and weather.

With the press we were able to average 20 tons each day, the bales coming out at the rate of one per minute, averaging 120 lb. per bale. The press required four men for actual working—one feeding, two tying wires, and one stacking the bales. The hay was carted from the paddock to the shed, and two lorries were sufficient for close haulage, but three were required for longer distances, with one pitcher in the paddock; say, allowing for an extra hand, a total of nine men and three lorries. This is rather a big order for one farm, and I tried to get neighbours to co-operate. The plant allows of an excellent opportunity for co-operation among groups of farmers, both in the purchase and the working of the plant, and the expense of pressing would then be not much greater than stacking.

The advantages of pressing may be summed up as follows :—

(*a*) A supply of fodder can be conserved and in a condition in which it is easily handled.

(*b*) Any surplus above farm requirements is a saleable commodity, which can be placed on rail at short notice and at a minimum of expense.

(*c*) Elimination of waste in stacking, and of loss from the ravages of mice, and of damage by windstorms and rain.

(*d*) Economy of space.

Regarding the last point, in 1924 we filled a hay shed with 70 tons, and the settling in the meantime allowed of a space between the sheaf hay and the roof, which was utilised this year. This shed now holds 200 tons of pressed hay. With a total of 130 tons of new hay, and 120 tons of old hay, and silage, I am able, even during this dry spell, to sleep at nights.

Fat Lamb Raising.

It has been found that we cannot go as far with the crosses as New Zealand, our winter season being so short as to make early lambing and early maturity essential. The importance of the purchase of one class of ewe cannot be too strongly stressed, as better returns will be obtained from the wool clip, and the drop of lambs will be more even, and consequently more attractive and saleable. To the Comeback ewe I now give pride of place, but I would like to define the Comeback ewe as being the progeny of a first or second-cross ewe mated to a Wanganella type of Merino ram. This gives a type closely resembling the crossbred, but with a more valuable fleece. There are now types of Comebacks which have lost nearly all trace of longwool blood.

The closer you approach to the Merino the earlier the lambing; the closer to the longwool, the later the lambing. Hence the unsuitability of the second-cross ewe to our conditions, the lamb coming too late to allow of it being marketed before hot weather and grass-seeds spoil the bloom. The following gives the lambing time of different classes of ewes mated to longwool rams :—

Merino, April.
Comeback, May.
First cross, June.
Second cross, July.
Longwool, August-September.

There will of course be slight fluctuations, due to seasonal conditions and the age of the ewe. As regards relative values, I would place the ewes in the following order of merit :—

	Value of Lamb.	Value of Wool.	Percentage of Lambs.
Merino	3	1 } equal	4
Comeback	1 } equal	1 } equal	3
First cross	1 } equal	3	2
Second cross	4	4	1

This places the Comeback as the first choice, with the first cross ewe slightly ahead of the Merino, and for preference I would select the Merino ewe (the large, plain-bodied type) for districts such as Condobolin, and the crossbred ewe for districts such as Molong. The table will no doubt give room for plenty of argument, especially regarding value of fleece, but the

experience of neighbours and of myself over a term of years has been that our Comeback wool (Border Leicester used in the first cross) grown under farm conditions has averaged and returned more per head than Merino. A further point against the Merino is that the risk is greater with early autumn lambs, owing to dry spells. The Merino ewe fails when it comes to the pinch; being of a more timid nervous nature, she does not respond to handling like the crosses.

Locally there has been a distinct improvement in methods, and quite good results have followed the purchase of cast-for-age Merino ewes, and joining them with Border Leicester rams. The last two seasons have been very favourable, but there is a risk with aged ewes unless you are prepared to give them good conditions. Of great importance is the necessity to keep all classes of ewes in good condition throughout the year, lambing losses being then reduced to a minimum. I prefer to purchase 2-tooth ewes and to hold them for about five years, when they are fattened and replaced by young ewes. You are not then forced to come on the market during a boom time to buy a line of ewes. The older ewes, although losing in wool returns, give greater lambing percentages.

The farmer who has purchased Merino ewes is often compelled to sacrifice them at a price which shows a substantial loss when dry conditions prevail and there is no market for his Merino lambs.

Selection of the Ram.

Having decided on the choice of the longwool ram, purchase well-bred sheep from a recognised breeder and do not breed from nondescripts, or there will evolve the type of mongrel crossbreds which was so plentiful a few years back. I would like to stress the importance of the percentage used. My practice is to use 2½ per cent., and not to join all the rams at first, but keeping a few in reserve. The results are a bigger percentage of lambs and a quick drop. The purchase of one extra ram to 200 ewes is not such a costly item when you consider that five extra lambs will pay the purchase money. It is not surprising the number of twin lambs that arrive in the ordinary flock from the use of longwools, as in my Border Leicester stud flock of 100 ewes last August-September lambing, eight ewes dropped triplets, fifty-two twins, and forty singles, a total of 168 lambs (160 lambs reared) from 100 ewes.

Increased Export Necessary.

It is admitted that over the greater area of New South Wales the Merino sheep must reign supreme, but throughout the extensive wheatbelt, crossbreds are especially adapted and can be fattened as lamb or mutton. The necessity for increased export is very urgent, the country being fully stocked, as evidenced by the fact that nineteen out of every twenty sheepowners are sellers. With another lambing soon to start, the position is grave. Once the re-stocking demand ceases, the position of the farmer with Merinos to

sell will be serious, as buyers will be able to select and purchase well-bred station lines. Last spring these farmers were unable to sell their Merino lambs, and they are mostly overstocked, whereas farmers with crossbred lambs were able to sell at remunerative prices, and have since carried only their usual number of breeding ewes. The export buyers refused to purchase Merino lambs, and even in respect to Comeback lambs they were not at all keen, one buyer remarking that he could not trust them out of his sight as for some unknown reason they would suddenly lose their bloom, and unless they were ready to truck he would not purchase. ' The same buyer bought crossbred lambs with six weeks' " lift."

Improve the Quality.

With the extension of the lamb-raising industry, there is difficulty in securing the right type of ewe, and it affords an opportunity for breeders outside the fattening area to breed first cross lambs, and hold them till the following autumn or spring, when they will find a ready sale—the ewe portion to breeders and the wether portion to fatteners. The young wethers will fatten to 50 or 60 lb. and are ideal for the export trade. The necessity is not so much for increased production as for improved production, which would allow of quality lamb and mutton being exported. New Zealand found that an export trade could not be built up with Merinos, hence the almost exclusive breeding of crossbreds.

The sheepowners of New South Wales have profited little from the experience of the last forty years, and still hold the increases of the good years to lose them when the drought year arrives. In the years 1922–23 this State lost ten million sheep besides lambs. It is truly a wonderful industry that can stand such losses, and although last year's lambing was, I think, stated at 8½ million lambs, our export was only 257,217 carcases of mutton, and 359,158 carcases of lambs, or a total export of 616,375 carcases.

New Zealand for the same period exported 2,317,062 carcases of mutton 4,409,671 carcases of lamb, a total of 6,726,733. New Zealand with her sheep totals half those of New South Wales, exported ten times as much. The advantages of New Zealand as regards climatic conditions are admitted, yet if they held on to their increases over three years as we do, it needs no stretch of the imagination to see what their position would be after a severe winter. Critics state we cannot hope to compete against New Zealand, but we could if we adopted up-to-date methods in breeding and fattening, and copied their most excellent marketing methods.

Re-soiling the Orchard.

This is one of the best methods of improving the growth and productivity of trees. It should be carried out when possible, as nothing but good can come from the operation.—W. J. Allen.

Farmers' Experiment Plots.

POTATO TRIALS, 1925.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

Potato trials were conducted with the following farmers :—

J. G. Ward, Sherwood, Macleay River.
F. Waters, East Kempsey, Macleay River.
J. P. Mooney, Dumaresq Island, Manning River.
J. Campbell, Wingham, Manning River.
M. Smith, Paterson, Paterson River.
J. G. Perrett, Miller's Forest, Hunter River.

The Season.

July was mostly dry and cold throughout the district and these conditions were favorable to the preparation of good seed-beds. A moderate rainfall during early August en ured sufficient moisture to guarantee a good germination. The sowings were made between the 17th and 27th August. The latter part of this month and September were dry and cold, and there were a number of frosts and dry westerly winds. These conditions caused the land to dry out much quicker than usually, with the result that early growth was somewhat retarded and it was noticed several plants were affected by frosts. October brought a continuation of dry cold windy weather, and in some centres, especially at Wingham, the crops were considerably handicapped through want of rain. A fairly general rainfall at the end of October brought some relief, but it was not until mid-November that the drought conditions really broke, and then the growth that took place was most remarkable. Especially at Wingham, Sherwood, and Dumaresq Island plants reached a height of 3 feet, and it was feared that the enormous top growth would be at the expense of the tuber formation, but this did not prove the case as will be seen from the table of yields.

Yields and Plots.

It is noteworthy that a white skinned variety topped the yields at each centre.

At Sherwood, Factor has been the leading variety for a number of years. and there is no doubt about its suitability for the medium loamy soils of the Upper Macleay. At Mr. Ward's the plot had been well prepared, the land being in fine tilth, moist and sweet. This centre, like the majority of the upper lands, is subject to dry spells in the late winter and spring, and it is necessary to adopt cultural operations suitable to the conservation of moisture. This Mr. Ward does.

At East Kempsey the conditions are different, the soil (a medium to heavy loam) is low-lying, damper, and consequently never as sweet as the up-river soils. Deep cultivation was given the plot, one ploughing (a disc) being 2 feet deep. Potatoes have not always been a success in this neighbourhood, owing to the prevalence of fungous diseases in the spring. However, this season was drier and consequently more suitable. Carman and Satisfaction were the best.

At Dumaresq Island the soil is a rich medium loam, well furnished with organic matter, the result of chopped maize stalks and other material being turned under earlier in the year. The seed-bed was in fine tilth and moist. Up-to-date and Manhattan were the heaviest yielders, some tubers of the latter variety being enormous.

The Wingham plot was sown on the damp side, the soil (a heavy loam, well charged with organic matter) not having dried sufficiently after the recent rain, which was heavier here than in most parts. The seeds being ploughed in, too, the covering was somewhat open and cloddy, but this was reduced to a somewhat finer tilth by a later harrowing. However, early growth was slow, due probably to the coldness of the ground; no doubt owing to the openness of the soil the plot also dried out more rapidly, and showed the effects of the drought to a greater extent than did plots of finer tilth. Respectable yields were harvested. Although Factor yielded heaviest, Carman was the best in quality, and the percentage of unmarketable tubers was only 10 per cent. compared with nearly 20 per cent. in the Factors. Satisfaction, too, were an excellent sample, and only showed 5 per cent. unmarketable. As on the other plots, Early Rose yielded poorly and the sample was poor, showing much second growth.

Factors were easily the best at Miller's Forest. This district is not renowned for its high yields, the dry spells which invariably happen in the spring being the cause, and the yields this year can be classed as fairly satisfactory.

The Manurial Trials.

In the manurial trials substantial increases were obtained by the application of fertilisers. Outstanding yields were due to 3¼ cwt. of the P 10 mixture, which is made up of 10 parts of superphosphate to 1½ parts each of sulphate of ammonia and sulphate of potash. The increases amounted to from 1¾ tons to 3¼ tons over the unmanured plots. Applications of 2¼ cwt. of P 7, which consists of equal parts of bone dust and superphosphate' and 2 cwt. 3qr. 14 lb. of P 1 (10 parts superphosphate to 1½ parts of sulphate of ammonia) also gave substantial increases. It is noteworthy that the plots sown on what is regarded as one of the most fertile farms in the locality showed the greatest increases from the application of fertilisers The idea that artificial manure is only necessary where the land is poorer has long been exploded. Fertilisers require a soil well furnished with plenty of organic matter and moisture to work upon for best results.

Other Notes.

Were it not for one spray irrigation applied to the plot at Paterson during October, the yields would have been very poor. The possibilities of irrigation for potatoes and green vegetable crops on the Hunter River and its tributaries, and in the fresh water regions of the rivers further north, might receive greater attention than at present from the farmers on the rich alluvial flats adjoining these rivers. Spray irrigation is regarded as the most suitable, and has been carried out successfully by the Messrs. Dyball on Taree Estate, Mr. Alex Smith, at Bandon Grove, and Mr. M. Smith at Paterson, as well as on many other farms.

Rainfall.

	Sherwood.	Kempsey.	Taree.*	Mille 's Forest.†
	Points.	Points.	Points.	Points.
July	7	6	66	...
August	237	411	404	385
September...	Nil.	9	26	101
October	154	136	185	239
November	840	815	680	156

* These rainfalls also approximately apply to Wingham.
† " " " Paterson.

Yields in Variety Trials.

Variety.	Sherwood.	East Kempsey.	Miller's Flat.	Paterson.	Dumaresq Is.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Factor	9 2 2	......	5 10 0	5 10 0	......
Early Rose ...	5 0 0	5 10 0	2 11 0	3 2 3	6 4 2
Satisfaction ...	6 3 6	6 17 2	2 7 1	3 19 1	8 7 0
Early Manhattan	6 15 2	6 13 2	2 9 0	3 15 1	11 0 0
Carman No. 1 ...	6 1 9	6 19 1	3 14 3	4 14 1	9 16 1
Up-to-date ...	......	6 1 3	3 10 1	3 18 2	10 6 1

Yields in Fertiliser Trials.

Fertiliser per acre.	Sherwood.	Paterson.	Dumaresq Island.
	t. c. q.	t. c. q.	t. c. q.
No manure	9 2 2	3 2 3	10 6 1
3½ cwt. P 10	12 7 1	5 7 1	12 3 2
2 cwt. 3 q. 14 lb. P1	11 19 2	5 3 2	10 6 1
2½ cwt. superphosphate	11 11 3	4 8 0	9 12 2
2 cwt. 3 q. 14 lb. P 2	11 5 3	3 18 2	10 8 0
2½ cwt. P 7	11 15 3	3 15 1	10 16 0

Upper North Coast.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

The following farmers co-operated with the Department in conducting potato trials in this district during the past season:—

H. Johnson, Condong, Tweed River.
C. Oliver, "Laureldale," Casino.
T. Hannah, junior, "Corra Lynn," Lawrence, Clarence River.
N. J. Hill, "Korora," Coff's Harbour.
M. McBaron, "Riverview," Raleigh, Bellinger River.
S. T. Walker, "Cranbrook," Deervale, via Dorrigo.

The splendid autumn and winter rains resulted in the soil being well supplied with moisture at planting. Germination was excellent, and good stands were obtained. Unfortunately the dry conditions in September and October checked growth considerably, and were responsible for light yields. When the season changed in November the heavy rains caused a considerable amount of second growth.

Late blight made its appearance during the wet conditions at the later end of the growing season, but owing to the crops having practically matured very little damage was done.

The dry conditions were responsible for the plot at Casino being a failure, whilst at Lawrence, the site of the experiment being very low, the heavy November rains caused waterlogging and consequent rotting of the tubers.

The Plots.

Condong.—Soil, alluvial loam; previous crop, maize; land ploughed June, July, and August and harrowed; planting carried out 25th August in drills 3 feet apart; seed covered with plough and lightly harrowed. The variety trial was manured with 2½ cwt. superphosphate per acre. All plots were harvested 11th January, 1926.

Coff's Harbour.—Soil, red volcanic loam; previous crop, maize and cowpeas; land ploughed in March and May, cultivated and rolled before planting: planted 19th August, in drills 3 feet apart. The variety trial was manured with 2½ cwt. superphosphate per acre. All plots were harvested on 16th December.

Raleigh.—Soil, alluvial loam; previous crop, maize; land ploughed end of June; disc-harrowed and harrowed prior to planting; planted 7th August in drills 3 feet apart. The variety trial was manured with 2½ cwt. superphosphate per acre. The manurial trial was situated on low-lying land, with the result that the heavy November rains caused waterlogging. The variety trial was harvested on 17th December.

Deervale.—Soil, red volcanic loam; previous crop, oats for winter green feed, fed-off, and stubble ploughed in; potatoes ploughed in 10th September, in every third furrow, and lightly harrowed. The variety trial manured with 2½ cwt. superphosphate per acre. All plots were harvested on 28th January.

RAINFALL during Growing Period.

Month.	Condong.	Coff's Harbour.	Raleigh.	Deervale.
1925.	Points.	Points.	Points.	Points.
August	70	128	65	.....
September	30	36	51	120
October	140	198	120	138
November . .	688	641	782	1,185
December	823	403	602	687
1926.				
January	252	......	......	1,154
Total	2,003	1,400	1,620	3,284

RESULTS of Variety Trial.

Variety.	Condong.			Coff's Harbour.			Raleigh.			Deervale.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.
Factor	7	10	1	4	14	1	5	1	1	4	16	3
Carman No. 1 .	8	2	0	5	4	0	2	19	3	3	8	2
Up-to-Date . ..	5	6	0	5	0	1	4	6	2	4	3	1
Langworthy	....			......			......			3	7	2
Early Manhattan ...	.....			3	16	2	2	3	1	0	17	3
Early Manistee	1	15	1	.....			2	15	0	....		
Early Rose	3	16	2	2	1	1	1	19	1	1	7	0
Satisfaction	1	3	2	2	5	1	1	18	1	1	19	1

From the above results it will be seen that the white-skinned varieties have given outstanding yields in comparison with the other varieties at all centres. All the above varieties were manured with 2½ cwt. superphosphate per acre.

RESULTS of Manurial Trial.

Fertiliser per Acre.	Condong.			Coff's Harbour.			Deervale.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.
P 3 mixture at 4 cwt. per acre... ...	8	7	2	6	7	3	5	10	1
P 7 ,, 2¼ ,, ...	8	0	0	4	14	1	5	5	1
M 13 ,, 3¼ ,, ...	9	12	1	4	6	2	5	1	0
Superphosphate at 2½ cwt. per acre ...	7	10	1	4	14	1	4	16	3
No manure	7	2	2	3	6	3	3	2	2

P 3 consists of 10 parts superphosphate, 3 parts sulphate of ammonia, and 3 parts sulphate of potash. P 7 consists of equal parts of superphosphate and bonedust. M 13 consists of 10 parts superphosphate and 3 parts sulphate of potash.

Factor was the variety used in the above trials. It will be noticed that n all plots the fertilisers gave increased results over the no-manure plots.

Soil Fertility.

Its Maintenance and Improvement by Means of Green Manure and Cover Crops.

[Concluded from page 236.]

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

Fertilising the Green Manure or Cover Crop.

Where such a crop is grown, an endeavour should be made to get as much growth into it as possible, for this will not only have a better effect on the subsequent crop but will also have a more lastingly beneficial effect on the soil. A green manure or soil improvement crop is not worth growing if it is not grown well. To this end the soil should be properly prepared and every means adopted to get as much growth in the crop in as short a time as possible, for it is taking the place of some of the main or cash crops on the farm.

To some farmers it may at first seem a wasteful practice to fertilise the green manure or cover crop, but on reflection it will be recognised as very sound business. This is particularly the case with leguminous crops, which generally respond so well to phosphates. No fear need be felt that superphosphate, added to such a crop, will be lost or be unprofitable; for not only are phosphates very difficult to leach from the soil, but if the fertiliser is not utilised by the crop to which it is applied, its residual effect will be observed on the subsequent crop. When such a crop is ploughed in also and the soil increased in organic matter and moisture-holding power, the residual fertiliser is in direct contact with moist soil and becomes more readily available to the next crop. No nitrogenous fertiliser is necessary for such leguminous crops, and it is doubted whether potash is necessary except on some soils.

On stiff soils the use of gypsum is helpful, not only in making the soil more amenable to cultivation for the preparation of a suitable seed-bed for the crop, but also inducing the latter to make a better growth.

It is well to remember that the soil-improvement crop, if a legume, enriches the soil in nitrogen, and the greater its growth the more nitrogen is added to the soil. There is every good reason, then, why the soil improvement leguminous crop should be fertilised with 1 to 2 cwt. superphosphate per acre.

Crops Following Green Manures.

Any organic matter, such as green manure or animal manure, requires to undergo decomposition before the subsequent crop can derive much benefit from it. This decay requires warmth and moisture, and even after decay the plant-food materials have to go into soluble forms. The nitrogen has to

change from an organic form to ammonia compounds and nitrites to nitrates. Most crops can only take up their nitrogen in the last form, but some crops, such as maize and potatoes, can absorb ammonia compounds and nitrites. Green manures therefore become more readily and effectively utilised by these crops than by many others. Cultivated crops generally are the best to follow green manures, for the aeration of the soil by cultivation hastens the decay of the organic matter. Of the cereal crops, oats are better than wheat to follow green manure. In most cases where a summer crop like maize follows a green manure crop, the latter should be ploughed in during the winter at the latest; for if the green manure crop is allowed to go into spring, it dries out the ground very badly, and the subsequent crop suffers in any but a very wet summer season. Failures of green manures to produce increases in the crops which follow are often due to this cause.

Flattening the Crop with the Roller.

Farmers well know the value of green manures if properly utilised, but the following results of experiments in New South Wales indicate how much the yield of the subsequent crop or crops is influenced by green manuring.

A green manure crop of cowpeas increased the yield of maize by 10 bushels per acre at Grafton Experiment Farm in 1923.

At Glen Innes Experiment Farm in 1923 the following average yields were obtained from the experiment plots in the rotation experiment:—

Maize after oaten hay, 21 bus. 22 lb. per acre.
Maize after maize, 26 bus. 44 lb. per acre.
Maize after Red clover, 43 bus. 15 lb. per acre.

Ploughing-in Green Manure.

It has been mentioned that warmth and moisture are necessary for the decay of green manure, and measures must sometimes be taken to accelerate this decay of the green manure. It is of the first importance that the material must be buried beneath the soil, and in order to get the best results it should be well distributed through the soil.

The accompanying illustrations show the best method of turning under a green manure crop. At Grafton Experiment Farm a crop of cowpeas was sown in November for green manure, following a cereal green fodder crop which had been cut in October. On part of the field where the cowpeas were thin a crop of Apple of Peru (False Cape Gooseberry) weed also came up, and the mass grew to a height of 3 or 4 feet.

Cutting the Crop up with the Disc-harrow.

The single-furrow mouldboard plough, with a chain attached to the swingle-bar, or the single-furrow disc-plough will effectively cover such a green manure crop, but the objection to that method is that the green manure is laid down in a mass under the soil, and the sour mass becomes abhorrent to the young roots of the succeeding crop.

The use of the roller to flatten down the green manure crop, followed by the disc-harrow, to chop it up thoroughly and mix it well with the surface soil, followed again by a two-furrow disc-plough (see illustrations), ensures that the green manure is not only covered but also thoroughly distributed through the soil beneath, leaving the soil in excellent condition for the next crop to be sown soon afterwards. Again, if the ground is dry and lumpy when the green manure is ploughed in, and remains dry for any time, the use of the roller is advisable to hasten decay by compacting the soil.

Green manure should be ploughed in at least three or four weeks before the planting of the next crop.

ORCHARD GREEN MANURING OR COVER CROPPING.

H. WENHOLZ and H. BROADFOOT, Senior Fruit Instructor.

In orchards, crops for soil improvement are in nearly all cases utilised entirely as green manure. They are grown primarily to improve the mechanical condition and fertility of the soil, though in some cases—as where an orchard is on a hillside—a cover crop is grown to save erosion or washing of the soil.

It has been stressed that the continued cultivation of any soil has the effect in time—by aerating and warming the soil, conserving its moisture, and making conditions more favourable to decomposition into soluble plant-

Ploughing under with the Disc-plough.

food—of depleting the organic matter. Cultivation is necessary to kill weeds and conserve moisture, and continued clean cultivation, such as is practised in the orchard, depletes the organic matter more quickly than in general farming.

Under continued cultivation, loam or clay loam soils lose their good physical condition with the depletion of organic matter, and the soil runs together quickly with every rain and bakes hard with the heat of summer before it can be easily cultivated, in some cases getting hard so quickly that further rain is required before cultivation is possible. Any soil that contains much clay has a tendency to suffer in this way from continued clean cultivation. Sandy soils lose their organic matter even more rapidly than loam or clay soils under cultivation, and the trees suffer on such soil, which heats up, and loses its moisture to a great depth, not only by evaporation, but also by percolation beyond the reach of the feeding roots.

Bearing in mind that fruit trees have a period of active growth and fruit development in which they must not suffer any lack of moisture, it is evident that any attempt to grow a crop between the trees at a time when it will compete with them for moisture would be inadvisable. Unless the rainfall in the district is such that more falls during the summer than is sufficient or good for the trees, a crop for green manuring should not be grown during this period, though exceptions may occur in the very heavy rainfall districts on the North Coast. Neither should a winter crop be allowed to grow far (if at all) into the spring, on account of the danger of drying out the ground just when the trees are ready to begin their active growth; though exceptions may be made in districts of cold, wet springs, such as the heavy rainfall areas of the Southern Highlands (Batlow), or irrigation areas, where the dryness of the soil can be corrected. It is not surprising that in the circumstances green manure crops in orchards are mostly autumn and winter growing crops like field peas, vetches, tick beans, &c., and these may generally be considered to be the best crops in most districts. Some of the annual clovers, however—Crimson, Berseem (or Egyptian), Annual Bokhara (or Hubam) and Subterranean—have not been given the trial they deserve in orchard green manuring.

On the North Coast, citrus fruit is the chief component of orchards, and a special effort should be made here, not only to make the best use of the season of heaviest rainfall but also to prevent the growth of any green manure crop going over into the early spring, when the trees are making fresh growth. The winters may often be somewhat dry here, and winter legumes do not, under such conditions, make much growth, whereas the late summer and early autumn are often very wet. As the autumn weather here is mild or fairly warm, it seems as if the best results from green manuring crops over a run of years will most probably be obtained from velvet beans, cowpeas or soybeans sown in mid or late summer (January or February), to be ploughed in about April or May.

On the Central Coast (particularly in the Gosford and Wyong districts), where citrus and deciduous orchards are numerous, the usual practice is to use field peas sown about February and ploughed in about May. A later sowing than February or perhaps March is inadvisable, because such a crop does not then make much growth until spring, and it is dangerous to allow the crop to go so late, on account (as previously mentioned) of the way in which it dries the ground. Although they have not been given much trial so far, summer legumes—such as soybeans, cowpeas or velvet beans—because of their bulkier growth, may be the means of adding more organic matter if sown as suggested on the North Coast, and especially in the case of citrus trees.

On the South Coast the rainfall is usually better in the winter months than on the North Coast, and winter legumes or clovers must be used.

In the Tableland Districts, field peas have to be sown late in summer or early in autumn to make the bulk of their growth before winter, as severe frosts will kill the crop entirely, when it loses its value for ploughing in.

Horse or tick beans stand frost better, and can be allowed to grow right in to the winter. On the Southern Tablelands, where the winter rainfall is heavy, some such crop as this is necessary, to act as a cover crop to prevent washing or leaching. Many orchardists object to field peas on account of their vining growth, and because of the consequent difficulty in ploughing them in. Some of the annual clovers (previously mentioned) are worth trial, and even soybeans where summer frosts are absent. Soybeans would have to be sown a little earlier (about the end of December or early in January) in order to make good growth before the end of April, as they must be ploughed in before the first frost.

In the drier Western Districts, it is doubtful if green manuring will be of any benefit; in fact, it may in many instances do more harm than good. It is possible that where a good winter rainfall can be depended on, a winter legume, such as field peas or tick beans or some of the clovers, may be beneficial; provided they are ploughed in well before the soil becomes dry in spring.

In the Murrumbidgee Irrigation Area, tick beans are taking the place of field peas, not only because of the better growth, but also because of the objection to the vining growth of the peas. In some cases, fruitgrowers on this area have given up green manuring entirely, because they have some trouble with the prunings getting mixed up with the green manure crop; but the trouble, such as it is, may be easily overcome, even if the green manure crop has to be sown only in alternate bays so as to leave a bay clear for the pruning and harvesting of the fruit. There is no place in New South Wales where green manuring is so necessary in fruit-growing as on the Murrumbidgee Irrigation Area. The continued irrigation and cultivation deplete the organic matter here very quickly, and soon put the heavy soils into such a bad physical condition that very great trouble and expense is involved in their cultivation. On some of these soils gypsum or some ameliorant for their physical condition has already become essential as a preliminary to ordinary cultivation and the growing of a green manure crop. Gypsum alone cannot be looked upon as a permanent ameliorant, because if anything it tends to exhaust the organic matter—the constituent so essential if one is to greatly or permanently improve the soil's water-holding power, ease of cultivation and tilth. Tick beans have been very successful as a green manure crop in orchards on this area, but their continued use has beeen found in a few cases to thicken the skins of citrus fruit undesirably, probably through excessive accumulation of nitrogen in the soil by the leguminous cropping. It is not certain whether this could have been avoided by a balancing of the plant-food material through the addition of phosphates, but a respite from green manuring can easily be given by growing the crops in alternate bays each year. Unfortunately, the practice of green manuring seems likely to be neglected here rather than overdone.

Where a choice of crops exists, it would be wise for the orchardist to consider some rotation, as the soil becomes more or less sick of one crop. It is because of this that growers should consider other crops than field peas, which are exclusively used at present.

Except for citrus trees in coastal districts, the direct use of fertilisers on fruit trees does not seem to have been attended with much success, but it can scarcely be thought that the plant-food materials are ever available in sufficient amount for the needs of trees on some soils. It is known that an application of superphosphate is practically essential with clovers, and induces a much better growth of the annual leguminous crops, such as are generally used for green manuring in orchards; and the greater the growth of green manure the more beneficial the effect on the trees, so that used in this way fertilisers have a definite indirect value. Add to this the fact that any unused fertiliser would be in intimate contact with the organic matter ploughed in, and would therefore be more likely to be acted on by the acids of the decaying material and more often in contact with moisture, and it would seem that the fertilising of fruit trees in this way is well worth consideration by all orchardists who practise green manuring.

Few who have tried green manuring in orchard or field doubt the value of the treatment. It is hoped that the information herein provided will prove of further assistance on the road to better crops.

Fruit Drying Trials at Hawkesbury Agricultural College.

Further experiments were carried out at Hawkesbury Agricultural College last season in the drying of apricots. All the fruit was first halved and pitted, and dried for a period of 13½ hours at 135 deg. The following results were obtained:—

Experiment No. 1.—80 lb. Blenheim apricots dried out to 12 lb. 5 oz. (Pits weighed 5 lb. 9 oz.)

Experiment No. 2.—80 lb. Hemskirke apricots dried out to 12 lb. 13 oz. (Pits weighed 5 lb. 6 oz.)

Experiment No. 3.—80 lb. Kaisha apricots dried out to 13 lb. 4 oz. (Pits weighed 5 lb. 5 oz.)

Experiment No. 4.—80 lb. Trevatt apricots dried out to 13 lb. 14 oz. (Pits weighed 5 lb. 3 oz.)

It may be remarked that the fruit in question was coastal-grown and that such fruit often dries lighter than that grown inland.

Fighting Tuberculosis in U.S.A.

It is gratifying to report that tuberculosis of live-stock is yielding to the aggressive campaign waged against it by Federal, State, and county forces. Improved State laws, liberal State appropriations, and a better understanding of the work by stockowners have aided the work. Field operations for the year showed a 32 per cent. increase in the number of cattle tested compared with the previous fiscal year. Tests were applied to over 7,000,000 cattle of which 3·1 per cent. showed tuberculous infection. This figure was slightly less than in the preceding year and was still lower than the average of former years.—Report of the Secretary of Agriculture, Washington.

Stringhalt in Horses.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research, and H. G. BELSCHNER, B.V.Sc., District Veterinary Officer, Orange.

WHAT is commonly known as Australian stringhalt, a peculiar exaggerated form of stringhalt, occurs very commonly in horses in certain districts in Australia in certain seasons, usually in midsummer. So common is it at times that the greater number of the horses in a locality may become affected. Fortunately most of these cases are only of a temporary nature, and after a few weeks (may be three or four months) the animals recover.

It has frequently been noticed that these cases occur in paddocks wherein the herbage consists largely, if not practically entirely, of "dandelion." This is not the true dandelion of Europe, and even here it is sometimes known by the name "flat weed." Like the true dandelion it has a bright yellow flower. Botanically it is known as *Hypochaeris radicata.* On account of this association, the opinion is widely held that this form of stringhalt is due to eating this so-called dandelion.

During 1924 certain feeding experiments were carried out with this plant at the Veterinary Research Station at Glenfield, but were entirely negative. It was felt, however, that possibly the amount fed was insufficient or the plant was used at the wrong stage of growth, and arrangements were therefore made to undertake a field-feeding test.

This was conducted recently by one of us (H.G.B.) at Orange. Many cases had been reported from that district during the previous summer, and enquiry during the early spring showed that at least several of these cases had occurred in dandelion paddocks in somewhat close proximity. On 9th December, 1925, a paddock that seemed ideal for our purpose was located, and arrangements were made to place a horse thereon on agistment. The paddock, which had an area of 20 acres, was then a "golden wave" of the weed.

An aged chestnut gelding was procured from another district and placed in this paddock on 17th December. Before doing so, however, it was carefully examined on more than one occasion for any evidence of stringhalt, and certain measurements were taken in order that should any wasting of muscles occur such might be gauged accurately. The plants were then in full flower.

This animal was inspected several times during the course of the experiment, but at no time were any symptoms of stringhalt noted. The horse was finally examined on 9th March, 1926, eighty-two days after it had been put into the paddock, and as no symptoms of stringhalt were detected the animal was removed. It will be kept under observation during the next few months to see how it goes on, but it is not considered likely that it will now develop stringhalt as experience in the past has been that the

disease develops earlier in the summer. At the time the experiment was concluded the "dandelion" had dried off, and there was very little other feed in the paddock.

Peculiarly enough, whilst neither this animal, nor other animals running with it, developed stringhalt, a racehorse which had been running for about two months in a paddock *across the road* became at this time badly affected, the symptoms being manifested by the animal at the beginning of March. An examination of this paddock revealed practically no dandelion at all—just a few green plants along the creek.

Conclusion.

It would be unwise, of course, to draw any conclusion from a single negative experiment, as the animal employed might have been insusceptible, but the fact that there were several other horses running in the paddock with this animal makes the experiment of more significance. We do not consider it should be taken as indicating in a definite manner that dandelion is not the cause of stringhalt, but rather that the depasturing of an animal on the flowering plant from time of flowering onward for over eleven weeks has not been found to produce the disease. The experiment does show, however, that even when eaten in quantity dandelion will not always cause the disease.

Whether dandelion is the cause or not remains unknown. It may be that the plant was at a stage too advanced to cause ill effects, although we have been informed that the flowering stage is what is looked upon as the harmful stage. Again, it may be that other factors are necessary, and in an endeavour to elucidate this problem further investigations will be made.

We should be especially glad to hear details of cases which have occurred during the past summer—or any season for that matter—for we feel they may provide a clue to the factors that were wanting in our experiment.

Increasing Farm Efficiency.

Let us not forget that after all the foundation of a prosperous agriculture must always lie in efficient and rightly adjusted production. Marketing cannot be separated from production. Fitting production to the needs of the market, moreover, implies more than merely furnishing products in suitable volume. Consumers are interested in quality as well as quantity. Farmers lose millions by offering products that the market will take only at a discount. They many times lose by not maintaining a proper balance among their different enterprises, by not raising good types of live stock, by not sowing the best available seed, by not making a correct choice of crops, by not employing the right size and type of machinery, and by not managing their business to the best advantage. Probably the farmer can do more for himself on the farm than anyone can do for him off the farm.—Report of the Secretary of Agriculture, Washington, U.S.A.

Some Noxious Weeds.

WITH SPECIAL REFERENCE TO THEIR CONTROL.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.*

NOXIOUS weeds have increased at an alarming rate in New South Wales during recent years, and, if the present rate of increase is maintained, the time is not far distant when it will be difficult indeed to find an acre of grazing land not infested.

At present there is unfortunately no known short cut to noxious weed eradication, and as weeds are on the increase, to delay only renders the task more difficult and more expensive. Some localities have already grappled with the problem and are making strenuous efforts at eradication.

The past few seasons have been very favourable to the growth of all summer growing weeds, and Bathurst burr in particular has been very much in evidence. Where possible, infested grazing areas should be cultivated and sown to crops for a few years until cleaned up. This method is being adopted in many localities with a good rainfall, particularly in the eastern Riverina where weeds are in some instances so numerous as to permit of no other treatment.

The Saffron Thistle.

The Saffron thistle has caused a good deal of discussion recently. Some individuals maintain that as the seed can be eaten it is not a serious weed, others state that it will in time choke itself out. The seed is certainly eaten by sheep after it has fallen to the ground, the thistle thus affording some feed for a short period, but it is only for a very limited portion of the year. In the meantime, however, the weed has taken the place of other plants, such as grasses or clovers, which would have provided feed for the whole year. The whole of the clovers and grasses can be eaten, whereas only the seed of the Saffron thistle is eaten, and, unquestionably the carrying capacity of the land it occupies is reduced.

As far as the second claim is concerned, there is even less backing The thistle does not as a rule choke itself out. Although there may be a few isolated instances of land badly infested afterwards becoming free from various causes, these few instances are more than offset by the numerous instances in southern districts of paddocks that have been completely in possession of Saffron thistle for a number of years. In some cases, tracks have to be cut to allow sheep to travel through it, and still there is no sign of the weed choking itself out. It is one of the most widely spread weeds in the south, it is rapidly increasing, and it should be eradicated before it gets out of hand.

* Notes of an address delivered at the Agricultural Bureau Conference, Young, March, 1926.

The only part of the south where this thistle should be tolerated is on the wind-swept heavy plain country in parts of western Riverina. On the heavy grazing country between Jerilderie and Deniliquin, for example, it seems to fulfil a useful purpose in sheltering the grasses and clovers from the severe winds, nor is it so objectionable in other ways as in that dry climate it generally only grows from 8 to 12 inches in height.

Although the Saffron thistle is not quite so objectionable to the grazier as it is to the wheat grower, it is nevertheless reducing the carrying capacity of the grazing areas, and therefore should not be tolerated, particularly in mixed farming districts.

At Wagga Experiment Farm a series of experiments is being conducted with poisonous sprays to determine the best means of eradication, but the results are not yet very definite.

At the present time the best known method of destruction is to mow the thistle when most of the seed has set and before it commences to fall. Then rake it into heaps or rows, and after allowing time to dry thoroughly, burn it. In this way all seeds will be burned much more efficiently than if the paddock is fired in the ordinary way. If cut at this stage the weed stands a good deal of handling without dropping any seed. If cut just as it comes into flower many plants will not shoot again from the base in dry years, but this method is not satisfactory in actual practice, as the thistles are not all at the same stage of maturity, and consequently flower at different periods. In a moist summer the plants will shoot again, even if cut at the later flowering stage

Mr. G. Hutchings, of Yerong Creek, has had such success with cutting and burning that practically not a saffron or star thistle can now be found on his property.

Stinkwort.

With such weeds as Bathurst burr, stinkwort, etc., the only method is to use the hoe before seeding. In fact, this is the only way of dealing with the majority of weeds on pasture areas.

Unfortunately weeds are not usually eradicated when they first make their appearance. It is not until they have become well established in a locality that any attempt is made to control them. This is not likely to be the case in the future, as many landowners have had their wits sharpened by past experiences, and they now view any new weed with suspicion, and promptly get information about it and closely watch it.

When stinkwort is prevalent on mixed farming properties the paddocks where the infestation is thickest should be ploughed up, and sown with wheat or oats for a few years until the weed is eradicated. No plants should be allowed to seed. The hoe should be used on any plants that escape this cultivation or are not eaten by the sheep.

The weed is reasonably palatable when it occurs in small quantities, but when plentiful it is not relished by stock. In certain districts it seems to be more palatable than in others, and it is more readily eaten in drier districts where the rainfall is heavier. Where the weed is plentiful the sheep must be

starved into eating it, though that is not a very effective means of eradication, and where it cannot be cultivated out of existence, such as on stony hills or uncleared country, it must be cut out by hand with the hoe.

St. John's Wort.

Landowners should make themselves familiar with all the worst weeds so that they can identify them as soon as they appear. If St. John's Wort had been recognised when it first made its appearance in New South Wales thousands of pounds would have been saved. This weed has now got such a firm hold at Tumbarumba that 3,000 acres of land where the weed is thickest are to be planted with pines in an effort to eradicate it. Every landholder in the southern district should be able to identify this dreaded weed. If it appears on his property, he should put a double handful of coarse salt on each plant and allow the salt to kill it. Hoeing it out is worse than useless, as it shoots again from any rootlets left in the ground. It is impossible to realise the difficulty of dealing with this weed unless it has actually been experienced. The Gadara Shire Council is spending £1 200 a year in the destruction of this weed alone. They have conscientiously undertaken to eradicate it within their boundary, not only to save their own land, but also to protect the surrounding districts from infestation. There is prospect of success, and the action of the shire is a commendable public action.

At Batlow a local honorary committee of four men was formed to attend to the eradication of St. John's Wort. This move has been highly successful and has relieved the shire council of a great deal of inspection work. I would recommend the formation of similar local bodies throughout the southern district to deal with all noxious weed problems and assist the shire councils in this work.

Although cultivation has been tried as a means of eradicating this weed, it has almost invariably failed. A really clean, bare fallow, well worked as required, would get rid of this weed, but unfortunately if any carelessness is allowed the weed escapes destruction. Even if it were possible to ensure thorough cultivation it would still be necessary to poison the weed on the headlands and near fences or creeks with either salt or arsenic.

Where stock can be excluded from an infested paddock, the use of arsenite of soda has prove effective in eradicating this weed. A suitable mixture for this purpose is obtained by using 1 lb. arsenic, 2 lb. of washing soda and 5 gallons of water. This should be liberally sprayed on the plants and adjoining soil. It is a highly poisonous mixture, and stock should not be allowed into a treated paddock until heavy rains have washed the poison into the ground.

Where arsenite of soda cannot be used, fairly coarse salt is effective. It should not be too coarse, and should be heaped around the base of each plant with the hands, the top of the plant being broken off to assist the salt in its work of destruction. As many of the plants escape observation, especially in sweet-briar country, it is necessary to go over the area frequently, to salt any plants that have previously escaped treatment, and to re-salt any to which sufficient was not applied at first.

Keep Farms Clean.

Many individuals throughout the southern district are making a strong effort to completely eradicate all weeds from their properties and their example should be followed by landowners who have an interest in the welfare of this country. Mr. G. Gow's property at Barellan furnishes a striking example of weed control. Although this is a fairly large mixed farming property, weeds are completely under control. Mr. Gow and his employees are, however, always on the lookout for Bathurst burr, saffron thistle, stinkwort, etc., and any plants found are immediately destroyed. Before the end of the season an organised search is made, and if any plants have escaped observation and produced seed they are cut (care being taken not to allow any of the seed to drop) and taken in to the homestead and burnt. Now that his property is practically free from weeds, Mr. Gow is determined to keep it so by constant vigilance.

Weeds on Fallows.

A few hints on the destruction of weeds on fallows may be of interest. Much difficulty is experienced in killing black thistles and paddymelons on fallow after they have attained some growth. Even when 12 inch notched points are used on the rigid tine scarifier, many black thistles escape destruction. The usual method is then to resort to the slow and laborious process of hoeing them out. If sloping knife bars are attached to the scarifier and carefully adjusted, even full grown black thistles cannot escape. I have seen excellent work done even with home-made knife bars, made from an old choke cutter from a harvester, but, of course, better work is done with more substantial knives. Such an implement can necessarily only be used on country free from roots, stumps, and large stones. No hoe work will be required when it is used. Paddymelons, as well as thistles, can be dealt with in this way.

I would also suggest the use of knife bars on rigid harrows. They cannot be attached to the stump-jump type, but can easily be adjusted on rigid harrows by a handy man. This implement will not destroy thistles or large paddymelons, but it is invaluable for cultivating fallows immediately after rain and when melons are just beginning to grow. If used at this time it is very effective, and avoids the necessity of using the cultivator at a later date From 80 to 90 acres a day may be dealt with by using large harrows. The fallow is cultivated in about one-fourth the time and at one-fourth the cost of using the rigid tine scarifier.

Infectious Diseases Reported in March.

The following outbreaks of the more important infectious diseases were reported during the month of March, 1926.

Anthrax	Nil.
Pleuro-pneumonia contagiosa	2
Piroplasmosis (tick fever)...	Nil.
Swine Fever...	Nil.
Blackleg	2

—Max Henry, Chief Veterinary Surgeon

Green Peas under Trial.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

DURING the past season a variety and manurial trial with green peas was conducted by Mr. J. W. Jay, of Ben Lomond. The plots were located on upland red friable basaltic soil, which sloped gently to the south. Potatoes had been grown on the land for four years continuously until 1923, prior to which the land had not been cultivated and was occupied by native pasture.

In September, 1924, peas were sown unmanured, and these were harvested in the latter part of December. A broadcast sowing of peas was made later in December and the green crop was ploughed under 5 inches deep in May. On 4th and 5th July, the section was again ploughed 7 inches deep and well harrowed in September.

On the 5th October, the peas w re ploughed in every third furrow, about 27 inches apart. The seed was dropped by hand and covered about 2½ inches deep. The rate of seeding ranged from 55 to 80 lb. per acre. The variety trial was unmanured.

A hail storm in November damaged the foliage and reduced the yield. An inspection on 18th November disclosed the least growth on the lime and unmanured plots, and the next poorest on the basic superphosphate plots. On all the other fertilised plots growth was satisfactory and about equal. At that time there was little to choose between varieties as to growth, all being about 6 inches high and sturdy.

On 24th December the various plots were well in flower. It was still noticeable that least growth had occurred on the unmanured and limed sections, but a better setting of pods had occurred on the latter.

Three pickings of green peas were made at the end of the first, second and third weeks of January.

Witham Wonder was a showy, well filled sample, and brought 10s. per bushel, the others realising 7s. and 8s.

The following are the results of the fertiliser trials :—

Fertiliser.	Amount per Acre.	Green Pods per Acre.
	lb.	bushels.
Basic Superphosphate	162	182
P 10	184	209
Lime	184	218
Blood and Bone...	150	250
Special Mixture	166	196
P 7...	162	180
Superphosphate	140	241
Unmanured	......	130

The blood and bone contained nitrogen 6 per cent., phosphoric acid 14 per cent., and was supplied at £8 per ton. The special mixture is the mineral equivalent for blood and bone, but costs about 18s. per ton more. Basic

superphosphate contains superphosphate with an addition of about 17 per cent. of lime; P7 contains equal parts of bonedust and superphosphate; P10 consists of $1\frac{1}{2}$ parts sulphate of ammonia, 10 parts superphosphate and $1\frac{1}{2}$ parts of sulphate of potash.

The most profitable fertiliser was superphosphate, which at a cost of 9s. per acre increased the yield 111 bushels per acre over the unmanured section. At 9s. per bushel for the peas in pod this showed a gain of £50 for an outlay of 9s. On other sections of the farm, superphosphate caused the pods to fill two to three weeks earlier than on the unmanured sections.

The following are the results of the variety trials :—

Variety	Green Pods per Acre bushels.	Variety.	Green Pods per Acre. bushels
Richard Seddon	150	Green Feast	173
Yorkshire Hero	173	English Defiance	163
Utility	121	Witham Wonder	126

The yield was considerably reduced by hail, and on all varieties a quantity of badly damaged pods was not harvested. The above yields are, however, considered comparable. The result indicates that the local favourite Green Feast still holds pride of place. Yorkshire Hero is not so well coloured and the pods are smaller generally. Rainfall was considered ample for the crop.

Apples Less Popular in Canada.

While the consumption of apples in Canada has fallen until it is less than half an apple per head a day, consumption of citrus fruit, owing to effective advertising, has increased, according to a recent statement by Mr. G. E. McIntosh, Dominion Fruit Commissioner at Ottawa. Through the elimination of the careless grower and his poor fruit, it was declared, the fruit industry in the Dominion as a whole is now in a better condition than for many years. According to the Commissioner, Canada has 200,000 acres in fruit orchards, valued at 120,000,000 dollars

Trees for Shade and Shelter.

The stockowner should recognise the value of shade and shelter. A little rough hill on the property, covered with with stunted gum-trees, is worth more to the farmer as it stands for shelter purposes than the small amount of grass it will grow should he decide to have it rung. To settlers in naturally clear country, judicious planting is a necessity. Some of our native trees lend themselves for shelter purposes admirably, while some species from other parts of the world adapt themselves to the same purpose.

A pamphlet on "Trees for Shade and Shelter," with recommendations for different districts, is one of the many free farming publications issued by the Department. Applications should be addressed to the Under-Secretary, Department of Agriculture, Sydney.

Egg-laying Tests at Hawkesbury Agricultural College.

(Under the Supervision of James Hadlington, Poultry Expert.)

TWENTY-FOURTH YEAR'S RESULTS, 1925–26.

F. H. HARVEY, Organising Secretary.

THE Twenty-fourth Egg-laying Competition at Hawkesbury Agricultural College commenced on 9th April, 1925, and terminated on 31st March, 1926, a period of 357 days. The reason for opening the competition on 9th April is that the interval between the 1st and the 9th makes it possible to remove from the pens the birds in the last competition and to place the new entrants in their pens without an intermediate change.

The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors representatives, namely, the College Principal (Mr. E. A. Southee), Messrs James Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College), C. Judson, J. H. Madrers, and L. D. Ellis (competitors' representatives), and F. H. Harvey (Department of Agriculture), Organising Secretary.

Scope of the Competition.

The competition embraced four sections, namely, open sections for light and heavy breeds, and standard sections for light and heavy breeds. This marks the seventh year in which competitions were provided for standard-bred birds, the qualification for entry in these sections being that the birds shall conform to the recognised standard for the breed.

The competitions were limited to pullets between seven and twelve months old on 1st April, 1925, and pens were allotted as follows:—

	Groups	Birds.
Section A.		
Open Light Breeds:— White Leghorns ...	50	300
Section B.		
Open Heavy Breeds:—		
Black Orpingtons .	23	138
Langshans	6	36
Plymouth Rocks ...	1	6
Section C1.		
Standard Light Breeds:— White Leghorns ...	5	30
Section C2.		
Standard Heavy Breeds:—		
Black Orpingtons	2	12
Langshans	2	12
Rhode Island Reds ...	1	6
Totals	90	540

Weight of Eggs.

The regulation that individual hens must lay eggs of at least 2 oz. each, and that eggs from groups must average at least 24 oz. per dozen within four months of the commencement of the competition in order to be eligible for prizes, resulted in the disqualification of eleven individual hens and two groups, as follows:—

Disqualified from Individual Prizes.

Light Breeds.—A. Campbell (No. 241), D. R. Dove (No. 274), H. D. Duncan (No. 278), Bide a Wee Poultry Farm (No. 376), J. R. Sellors (No. 424), D. Sutton (No. 453).

Heavy Breeds.—A. George (No. 36), T. MacDonald (No. 86), A. R. Wheatley (Nos. 118 and 120), N. Townsend (No. 528).

Disqualified from Group Prizes.

Light Breeds.—D. Sutton. Heavy Breeds.—A. R. Wheatley.

Prices of Eggs.

The prices, calculated to the nearest penny, from the account sales received at the College for sale of the competition eggs, were as follows:—

Month		Price per doz. s.	d.	Month		Price per doz. s.	d.	Month		Price per doz. s.	d.
April,	1925	2	6	August,	1925	1	4	Dec.,	1925	1	7
May,	,,	2	9	Sept.,	,,	1	4	January,	1926	1	4
June,	,,	2	8	October,	,,	1	4	February,	,,	1	7
July,	,,	2	0	Nov.,	,,	1	5	March,	,,	2	3

The Financial Aspect.

The quantities of feed consumed by the 540 birds were as follows:—

Wheat	247 bushels 25 lb.		Salt	249 lb. 12 oz.
Maize	144 ,, 26 ,,		Shell grit	1 ton 8 cwt
Pollard	743 ,, 8 ,,		Green feed	82 cwt.
Bran	371 ,, 14 ,,		Epsom salts	51 lb.
Meat meal	11 cwt. 71 ,,			

Based on wholesale prices in Sydney, the total cost would have been £271 3s. 3d., equal to 10s. per head, but owing to a favourable bulk purchase of wheat, the cost to the College was £259 17s. 5d., equal to 9s. 7d. per head.

The Monthly Laying.

Month.		Section A. Open Light Breeds.		Section B. Open Heavy Breeds.		Section C1. Standard Light Breeds		Section C2. Standard Heavy Breeds.		Total.
		Total for 300 hens.	Average per hen	Total for 180 hens.	Average per hen	Total for 30 hens.	Average per hen.	Total for 30 hens.	Average per hen	
April,	1925	1,480	4·9	1,461	8·1	146	4·9	172	5·7	3,259
May,	,,	3,459	11·5	2,208	12·3	336	11·2	463	15·5	6,466
June,	,,	5,097	17·0	3,255	18·1	516	17·2	537	17·9	9,405
July,	,,	5,793	19·3	3,740	20·8	563	18·8	571	19·0	10,667
August,	,,	6,353	21·2	3,954	22·0	606	20·2	625	20·8	11,538
September,	,,	6,582	21·9	3,934	21·9	604	20·1	603	20·1	11,723
October,	,,	6,860	22·9	3,750	20·8	596	19·9	596	19·9	11,802
November,	,,	5,401	18·0	3,191	17·7	569	19·0	515	17·2	9,676
December,	,,	6,987	23·3	2,921	16·2	529	17·6	399	13·3	10,836
January,	1926	5,619	18·7	2,726	15·1	468	15·6	397	13·2	9,210
February,	,,	4,566	15·2	2,317	12·9	384	12·8	320	10·7	7,587
March,	,,	3,566	11·9	2,375	13·2	297	9·9	378	12·6	6,616
Total ...		61,763	205·9	35,832	199·1	5,614	187·1	5,576	185·9	108,785

Annual Competition.

Full details of the financial and other results since the inception of the competition are given in the following comparative table :—

	No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st ...	38	1,113	459	137	130	1/1	15/6	6/-	9/6
2nd ...	70	1,308	666	160	163	1/3¾	17/9	5/9¾	12/-
3rd ...	100	1,224	532	154	152	1/-	12/9	4/5½	8/3
4th ...	100	1,411	635	168	166	-/11½	13/3	5/3½	8/-
5th ...	100	1,481	721	162	171	1/0½	14/10	5/10	9/-
6th ...	60	1,474	665	161	173	1/2¼	17/2	7/-	10/2
7th ...	50	1,379	656	159	180	1/3¼	19/2	7/9½	11/4
8th ...	60	1,394	739	158	181	1/5¼	21/9	6/9	15/-
9th ...	40	1,321	658	151	168	1/2	16/3½	6/5½	10/2
10th ...	50	1,389	687	146	184	1/2½	18/5½	6/1½	12/4
11th ...	50	1,461	603	156	178	1/3½	19/4¼	7/3½	12/0¾
12th ...	50	1,360	724	152	177	1/2½	17/7	5/9	11/10
13th ...	63	1,541	705	162	181	1/2	17/8½	6/9½	10/11
14th ...	70	1,449	506	165	192	1/4½	22/2	7/7	14/7
15th A	40	1,526	924	162	216	1/3¾	28/8¾	6/10	16/10¾
15th B	30	1,479	749	165	192	1/3¾	21/7½	6/10	14/9½
16th A	40	1,525	923	157	209	1/4	21/9¾	7/8	14/1¾
16th B	30	1,613	931	170	202	1/4	21/2	7/8	13/6
17th A	40	1,448	860	153	199	1/5½	22/0½	7/10	14/2½
17th B	30	1,517	815	151	189	1/5½	21/11¼	7/10	14/1¼
18th A	30	1,438	988	148	203	1/10	28/10	9/3	19/7
18th B	50	1,428	745	151	190	1/10	28/1	9/3	18/10
18th C1	3	1,304	977	138	195	1/10	27/8	9/3	18/5
18th C2	7	1,336	955	150	191	1/10	28/5	9/3	19/2
19th A	33	1,516	996	167	206	2/2	37/11	12/8	25/3
19th B	47	1,488	955	168	204	2/2	37/11	12/8	25/3
19th C1	5	1,425	944	148	195	2/2	36/-	12/8	23/4
19th C2	5	1,298	1,020	150	193	2/2	35/9	12/8	23/1
20th A	45	1,480	881	157	196	1/11	30/10	11/9	19/1
20th B	35	1,457	696	160	192	1/11	31/2	11/9	19/5
20th C1	5	1,092	885	144	168	1/11	24/7	11/9	12/10
20th C2	5	1,370	1,092	147	197	1/11	33/5	11/9	21/8
21st A	50	1,425	646	164	195	1/9	28/5	10/10	17/7
21st B	30	1,417	720	164	188	1/9	27/5	10/10	16/7
21st C1	5	1,220	864	149	176	1/9	25/8	10/10	14/10
21st C2	5	1,212	931	144	187	1/9	27/3	10/10	16/5
22nd A	50	1,508	942	161	210	1/6	26/3	9/9	16/6
22nd B	30	1,600	871	164	203	1/6	26/3	9/9	16/6
22nd C1	5	1,307	692	142	170	1/6	21/1	9/9	11/4
22nd C2	5	1,430	1,052	152	205	1/6	26/9	9/9	17/-
23rd A	57	1,470	961	160	212	1/8	28/7	9/11	18/8
23rd B	23	1,558	1,006	164	211	1/8	29/2	9/11	19/3
23rd C1	5	1,291	950	146	180	1/8	23/5	9/11	13/6
23rd C2	5	1,308	1,049	159	192	1/8	27/5	9/11	17/6
24th A	50	1,444	803	158	206	1/6	26/5	10/-	16/5
24th B	30	1,466	916	171	199	1/6	26/4	10/-	16/4
24th C1	5	1,248	881	136	187	1/6	25/-	10/-	15/-
24th C2	5	1,331	777	151	186	1/6	24/7	10/-	14/7

Monthly Laying of Individual Prize Winners.

The following table shows the monthly laying of winners of the individual prizes for highest scores :—

Owner and Breed.	April.	May.	June.	July.	August.	September	October.	November.	December.	January.	February.	March.	Total.
	Light Breeds.												
A Hughes White Leghorn	16	25	25	25	25	27	29	25	26	26	26	26	30·
B L Blake : White Leghorn	15	8	19	24	27	28	29	29	28	30	28	26	284
F T. Wimble : White Leghorn	10	26	25	25	24	26	25	25	25	26	23	24	284
G Hopping : White Leghorn	6	18	20	23	24	25	29	25	29	27	22	24	272
	Heavy Breeds.												
W. M. Mulliner : Black Orpington	16	27	27	23	28	25	27	25	24	26	28	19	296
C. Judson and Son . Black Orpington	15	4	23	28	30	27	29	29	29	28	25	27	294
C. Judson and Son Black Orpington	12	21	24	25	27	27	30	26	28	28	21	23	292
P. A. Barrett : Langshan	10	7	23	24	28	28	30	30	29	28	22	23	282
C F. Cummings Black Orpington	6	24	25	26	27	29	30	27	23	26	23	16	282

Averages of Breeds.

No. of Birds	Breed.	Eggs per Hen.	Weight of eggs per dozen	Value per Hen.
	Open Light Breeds.		oz.	£ s. d.
300	White Leghorn	206	25¾	1 6 5
	Open Heavy Breeds			
138	Black Orpington	201	25½	1 6 11
36	Langshan	183	26	1 3 1
6	Plymouth Rock	210	25	1 8 5
	Standard Light Breeds.			
30	White Leghorn	190	26¼	1 4 7
	Standard Heavy Breeds.			
12	Black Orpington	202	27¼	1 7 11
12	Langshan	191	25	1 6 2
6	Rhode Island Red	128	26	0 18 6

Weights of Winning Birds.

The following are the weights of the winning birds at the beginning and end of the competition :—

Groups.		Weight at April, 1925.		Weight at March, 1926.	
		lb.	oz.	lb	oz.
Light Breeds—					
I. Lowery's White Leghorn, Nos. ...	313	3	12	4	3
	314	4	0	4	2
	315	4	6	4	4
	316	3	8	3	8
	317	4	4	4	12
	318	4	0	4	4
Heavy Breeds—					
J H. Madrers' Black Orpington Nos.	79	5	10	(bird dead).	
	80	5	12	6	0
	81	5	14	6	8
	82	5	10	5	12
	83	5	14	5	6
	84	6	4	6	2
Individual Hens.					
Light Breeds—					
A. Hughes' White Leghorn, No. 331... ...		3	8	4	0
Heavy Breeds—					
W. M. Mulliner's Black Orpington No. 517		6	0	7	0

PRIZE LIST.

Golden Egg of 1926.

A special prize (value £25), donated by the Metropolitan Meat Industry Board, open to groups of six birds completing the Competition on points to be awarded for number, quality, and market value of eggs, also standard quality of the birds :—W. M. Mulliner (Black Orpington), 1,331 eggs, market value £9 4s. 7d.

Grand Champion Prize.

A prize of £5 5s. for group laying eggs of the greatest market value.—J. H. Madrers (Black Orpington), 1,466 eggs, market value £10 5s. 1d.

Special Prizes.

C. Judson and Son's Special Prize, £2 2s.—Awarded to the first bird in the Competition to reach a score of 200—W. M. Mulliner (Black Orpington); 200th egg laid on 227th day of the Competition.

J. H. Madrers' Special Prize, £2 2s.—Awarded for the bird which lays the greatest score in consecutive laying—P. A. Barrett, Langshan.

Quality Prizes.

For highest scores among birds in open sections, selected for standard quality :—

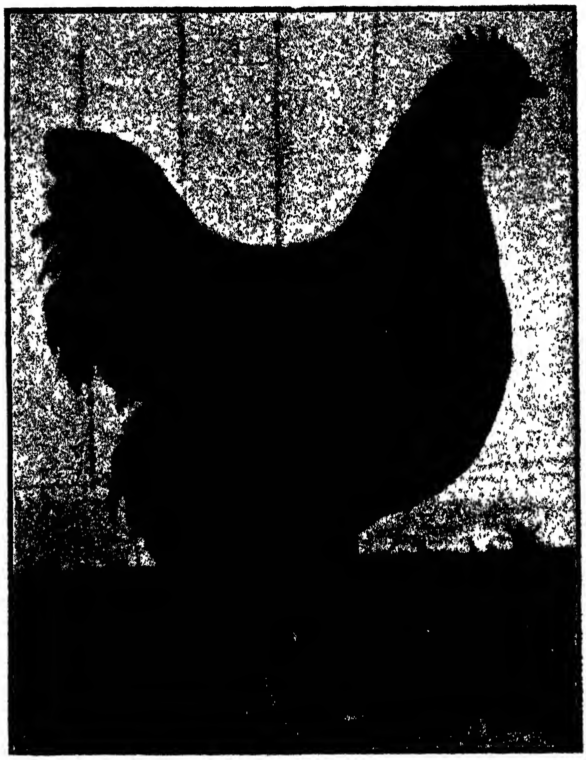
Light Breeds.—I. Lowery (White Leghorn), 1,444 eggs, £5; H. J. Cox (White Leghorn), 1,347 eggs, £2 10s.

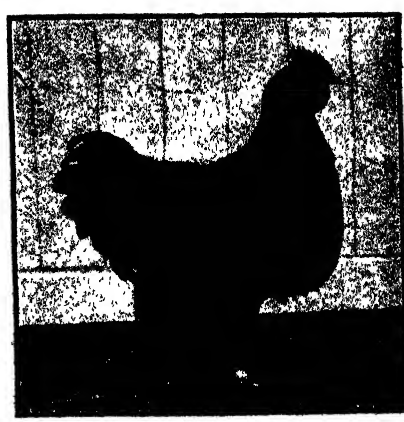
Heavy Breeds.—J. H. Madrers (Black Orpington), 1,466 eggs, £5; J. W. Smiles (Black Orpington), 1,346 eggs, £2 10s.

For highest scores among birds in standard sections, selected for standard quality :—

Light Breeds.—D. McAlpine (White Leghorn), 1,248 eggs, £2; Hilder Bros. (White Leghorn), 1,224 eggs, £1.

Heavy Breeds—W. M. Mulliner (Black Orpington), 1,331 eggs, £2; W. Townsend (Langshan), 1,235 eggs, £1.





Three of Mr. W. M. Mulliner's Group of Black Orpingtons which won the "Golden Egg of 1926."

The top bird was the leading hen, laying 296 eggs in the 357 days. The photograph was taken when she reached the 200-egg mark—the first to do so.

HIGHEST AVERAGE PRIZES FOR GROUPS OF FIVE OR SIX BIRDS.

Light Breeds.—I. Lowery (White Leghorn), 241 eggs, £3; Bide-a-Wee Poultry Farm (White Leghorn), 240 eggs, £2 10s.; F. G. Lombe (White Leghorn), 238 eggs, £2; F. T. Wimble (White Leghorn), 237 eggs, £1 10s.

Heavy Breeds.—J. H. Madrers (Black Orpington), 251 eggs, £3; C. Judson and Son (Black Orpington), 242 eggs, £2 10s.; C. F. Cummings (Black Orpington), 238 eggs, £2; A. H. Moxey (Black Orpington), 231 eggs, £1 10s.

HIGHEST GROUP PRIZES.

Light Breeds.—I. Lowery (White Leghorn), 1,444 eggs, £3; Bide-a-Wee Poultry Farm (White Leghorn), 1,441 eggs, £2 10s.; F. T. Wimble (White Leghorn), 1,422 eggs, £2; W. E. Strickland (White Leghorn), 1,396 eggs, £1 10s.; B. Clarke (White Leghorn), 1,363 eggs, £1.

Heavy Breeds.—J. H. Madrers (Black Orpington), 1,466 eggs, £3; C. F. Cummings (Black Orpington), 1,430 eggs, £2 10s.; J. W. Smiles (Black Orpington), 1,346 eggs, £2; C. Judson and Son (Black Orpington), 1,334 eggs, £1 10s.; W. M. Mulliner (Black Orpington), 1,331 eggs, £1.

HIGHEST INDIVIDUAL SCORES.

Light Breeds.—A. Hughes (White Leghorn), 301 eggs, £2 10s.; B. L. Blake (White Leghorn), 284 eggs, and F. T. Wimble (White Leghorn), 284 eggs, divide £2 and £1 10s.; G. Hopping (White Leghorn), 272 eggs, £1.

Heavy Breeds.—W. M. Mulliner (Black Orpington), 296 eggs, £2 10s.; C. Judson and Son (Black Orpington), 294 eggs, £2; C. Judson and Son (Black Orpington), 292 eggs, £1 10s.; P. A. Barrett (Langshan), 282 eggs, and C. F. Cummings (Black Orpington) 282 eggs, divide £1.

QUARTERLY PRIZES.

Winter test (10th April to 30th June, 1925):—

Light Breeds.—Bide-a-Wee Poultry Farm (White Leghorn), 315 eggs, £2; F. G. Lombe (White Leghorn), 297 eggs, £1 10s.

Heavy Breeds.—J. H. Madrers (Black Orpington), 367 eggs, £2; W. M. Mulliner (Black Orpington), 337 eggs, £1 10s.

Spring test (1st July to 30th September, 1925):—

Light Breeds.—Mrs. M. Geary (White Leghorn), 428 eggs, £1 10s.; R. McLean (White Leghorn), 417 eggs, £1.

Heavy Breeds.—C. F. Cummings (Black Orpington), 490 eggs, £1 10s.; J. D. Martin (Plymouth Rock), 437 eggs, £1.

Summer test (1st October to 31st December, 1925):—

Light Breeds.—J. Jefferson (White Leghorn), 456 eggs, £1 10s.; F. A. Bailey (White Leghorn), 447 eggs, £1.

Heavy Breeds.—C. F. Cummings (Black Orpington), 405 eggs, £1 10s.; P. A. Barrett (Langshan), 379 eggs, £1.

Autumn test (1st January to 31st March, 1926):—

Light Breeds.—I. Lowery (White Leghorn), 363 eggs, £2; G. Hopping (White Leghorn), 355 eggs, £1 10s.

Heavy Breeds.—F. W. Button (Black Orpington), 332 eggs, £2; J. H. Madrers (Black Orpington), 313 eggs, £1 10s.

THE POULTRY EXPERT'S COMMENTS.

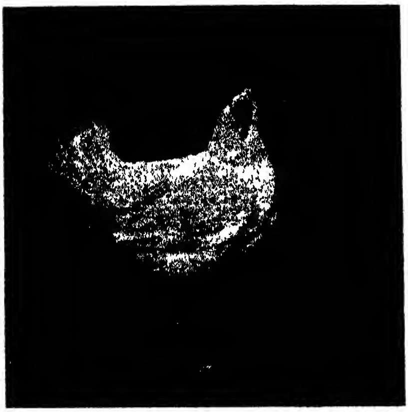
The most noticeable feature of the test just concluded is that there has been a slide back to mediocre performances in all sections. There are no outstanding records, and only one hen has passed the 300-egg mark. The best group has only laid 1466 eggs, against 1558 in the last test, and 1613 in the year 1918, which stands as a record for the College. The general average of production is only 201, compared with that of last year, which reached the highest mark in these series of tests—208·5 eggs.

All this goes to show that sports in production, such as occurred last year, are not to be relied upon as evidence of permanently increased laying ability.

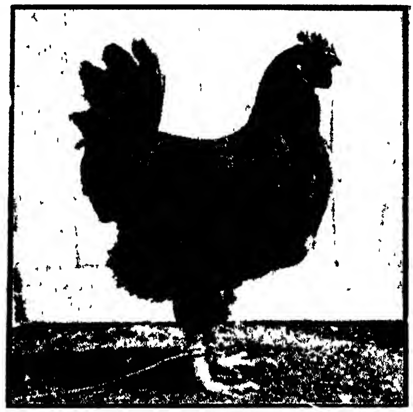
Three of Mr. J. H. Madrers' Black Orpingtons.
Grand Champion Prize, for group laying eggs of greatest market value (1,466).

Three of Mr. I. Lowery's White Leghorns.
First Prize in Open Light Breeds Section (1,444 eggs).

The facts in this connection are that the 1924-25 test had met with most favourable weather conditions, while that of this year has experienced the reverse. It will be remembered that during the early weeks of this test rainy conditions prevailed, and the first two months showed a considerable falling off in average production in comparison with the same period of the



One of the Group of White Leghorns entered by Bide-a-Wee Poultry Farm.
Second prize in Open Light Breeds Section.



One of Mr. C. F. Cummings' Black Orpingtons.
Second prize in Open Heavy Breeds Section.

One of Messrs. C. Judson and Son's Black Orpingtons.
This bird laid 294 eggs.

One of Mr. A. Hughes' White Leghorns.
This bird laid 301 eggs.

previous year. This leeway was never recovered. It has been a general experience right through these tests that what is lost during the early months of the competition is never regained later. In this a lesson is conveyed to all engaged in the industry, viz., that it is hopeless to expect such an acceleration of laying in the later months as will compensate for ground lost early in the laying life of pullets.

In addition to the unfavourable weather conditions at the commencement of the test, the birds passed through a very trying time during the heat wave conditions that prevailed in February, and all things considered the performances can be regarded as at any rate up to expectations on an even basis of laying ability. This however, leaves little room for the idea that we are consistently increasing the average of egg-production.

The outstanding fact is that viewed over several years past, production appears to be about stationary, and the only real gain in production was the outcome of a rule introduced some ten years ago, insisting upon better physique in the birds entered for competition.

There is still room for improvement in the same direction, and I believe that raising the minimum weight of Leghorns from 3½lb. to 4lb. would be followed by better scoring in this section. While not proposing to advocate the enforcement of this at present, I would urge breeders to consider this point seriously in connection with the birds entered for future tests.

Trophy "Golden Egg of 1926."
Donated by the Metropolitan Meat Industry Board.

Some performances in this test are worthy of mention. The winning group in heavy breeds (Mr. J. P. Madrers'), for instance, was handicapped for four months by the fact of only having five hens competing, one having died. In this, too, Mr. Madrers was debarred from competition for the "Golden Egg Trophy."

Whoever might have coveted this "Golden Egg Trophy" presented for the first time by the Metropolitan Meat Industry Board, no one will grudge Mr. W. H. Mulliner his good fortune in winning it. This breeder has been one of the most consistent of a small number of poultry farmers who have for some years competed in the Standard Section in an endeavour to show that standard bred Orpingtons can hold their own as egg producers. The poultry industry would be all the better for more breeders of Mr. Mulliner's calibre.

Economic Features.

The cost of feeding as against the average price of eggs during the year is another feature on the economic side of these competitions. A good deal of speculation is sometimes indulged in these matters, but the Competition

returns are the most reliable guide to cost of feeding that can be obtained, because the issue is not complicated by all sorts of deductions such as would be the case on an ordinary farm, in order to arrive at even an approximate conclusion. As far, however, as the average price of eggs is concerned, some allowance must be made for the fact that more eggs are obtained in the Competition in the early months from a given number of pullets than from an ordinary flock on the farm.

The Ration Fed to the Competing Birds.

The birds have as usual been fed on a simple ration which is best expressed as under:—

The Morning Mash.

Pollard	60 lb.
Bran	35 lb.
M.I.B. Meat Meal (or compo. meal 5 lb.)	5 lb.
	100 lb.

The Evening Ration of Grain.

Two-thirds wheat

One-third crushed maize.

Egg-yields of Each Bird and Group in the Twenty-fourth Annual Competition.

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
Open Heavy Breeds.								oz.	£	s.	d.
J. H. Madrers: Black Orpingtons	*210	269	221	245	259	262	1,466	26	10	5	1
C. F. Cummings: Black Orpingtons	169	264	282	242	249	224	1,430	25¾	9	7	0
J. W. Smiles: Black Orpingtons	289	236	243	226	191	211	1,346	25½	9	13	0
C. Judson & Son: Black Orpingtons	292	*122	203	202	221	294	1,334	25½	8	15	6
Grasmere P. Farm: Black Orpingtons	231	241	219	*166	212	243	1,312	26½	8	16	8
F. C. Nicholls: Black Orpingtons ..	167	253	219	255	241	135	1,270	25¼	8	16	7
J. D. Martin: Plymouth Rocks ..	180	205	219	221	262	*172	1,259	25	8	10	9
A. R. Kennedy: Black Orpingtons	238	186	233	195	†227	178	1,257	26	8	7	1
M. and H. Williamson, Black Orpingtons.	184	246	187	173	226	240	1,256	26½	8	15	2
A. H. Moxey: Black Orpingtons .	*80	234	235	205	246	235	1,235	24½	8	12	9
P. A. Barrett: Langshans	244	206	166	†126	282	193	1,217	26	7	12	2
R. B. Kenway: Black Orpingtons ..	203	278	*89	212	213	220	1,215	25	7	18	2
H. S. Lewis: Black Orpingtons ..	*170	235	285	165	†185	219	1,209	27½	8	0	5
V. J. Winn: Black Orpingtons ..	231	223	234	219	165	135	1,207	25	8	7	5
A. R. Wheatley: Black Orpingtons..	227	21	230	‡218	271	†225	1,201	23¾	8	1	10
H. R. Woolf: Langshans	196	212	241	139	163	240	1,190	26	8	1	11
A. George: Black Orpingtons ..	171	185	†166	247	217	203	1,189	26	7	12	2
O. J. Craker: Black Orpingtons ..	202	209	219	242	160	144	1,176	24¾	7	15	5
F. W. Button: Black Orpingtons ..	238	211	222	196	178	117	1,162	26¾	7	7	0
E. C. Lunn & Son: Black Orpingtons	*192	177	180	228	189	174	1,140	26	7	8	10
G. E. Holmes, Black Orpingtons ..	170	187	225	232	168	*155	1,137	25¾	7	4	11
S. A. Clarke: Black Orpingtons ..	217	197	175	205	176	160	1,130	26¼	7	9	1
Mrs. M. Dutch: Black Orpingtons..	*64	245	226	224	170	172	1,101	25¾	7	8	6
E. F. Goldsmith: Langshans ..	181	190	222	†158	197	†138	1,086	26	6	6	2
A. E. Ross: Langshans	163	190	151	209	204	149	1,066	25¼	6	14	11
W. H. Luxton: Langshans	157	222	185	*105	*132	253	1,054	26½	7	5	10
F. Henry: Black Orpingtons ..	127	232	114	209	231	*123	1,036	25¾	6	14	4
T. McDonald: Black Orpingtons ..	126	‡28	238	199	201	243	1,035	24½	6	18	6
H. G. Sykes: Langshans	179	153	142	191	114	212	991	25¾	6	8	3
P. W. Wallace: Black Orpingtons..	*2	189	166	287	165	*166	916	25¾	6	3	2

* Signifies bird dead or withdrawn and score retained.
† Signifies bird replaced and previous score struck out.
‡ Signifies eggs under the prescribed weight of 24 oz. per dozen.

Egg-yields of Each Bird and Group in the Twenty-fourth Annual Competition—*continued.*

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
			Open Light Breeds.					oz.	£	s.	d.
I. Lowery : White Leghorns	224	238	230	251	236	265	1,444	26¼	9	4	0
Bide-a-Wee Poultry Farm : White Leghorns.	210	268	239	‡274	217	238	1,441	24¾	9	14	0
F. T. Wimble : White Leghorns ..	193	265	189	236	255	284	1,422	25¾	9	6	6
W. E. Strickland : White Leghorns	248	198	241	259	222	238	1,306	26¾	9	4	1
B. Clarke : White Leghorns	202	223	246	248	224	225	1,368	25½	8	14	11
J. Jefferson : White Leghorns .	229	176	226	249	244	238	1,362	27	8	10	3
G. Hopping : White Leghorns ..	239	202	272	207	183	257	1,360	26	8	15	3
J. R. Sellors : White Leghorns ..	243	234	217	†235	172	249	1,350	24½	8	19	4
H. J. Cox : White Leghorns. ..	185	244	204	237	*230	247	1,347	24¾	8	18	5
L. A. Ellis : White Leghorns ..	232	226	248	199	251	*189	1,345	25	8	16	8
R. McLean : White Leghorns ..	155	267	222	245	233	218	1,340	25¼	8	12	2
F. G. Lombe : White Leghorns ..	249	262	*146	219	210	250	1,336	26½	9	1	4
J. C. Smith : White Leghorns ..	220	243	192	244	248	180	1,332	26¾	8	13	0
H. S. Crear : White Leghorns ..	220	231	191	198	241	243	1,324	25¾	8	8	5
A. Hughes : White Leghorns ..	301	199	205	223	254	141	1,323	27	8	15	2
D. Asher : White Leghorns	219	167	183	258	259	227	1,313	26¼	8	11	8
Mrs. M. Geary : White Leghorns .	195	243	176	212	230	227	1,283	27¼	8	3	0
W. Hunt : White Leghorns	206	214	216	201	236	192	1,265	25½	8	6	1
F. A. Bailey : White Leghorns ..	188	160	221	241	209	244	1,263	26	7	12	8
M. C. Byrne : White Leghorns .	164	251	189	209	225	233	1,271	24¾	8	3	[illegible]
D. R. Dove : White Leghorns ..	†118	219	234	†239	220	245	1,270	24½	8	2	9
Lewis and Stephens : White Leghorns	205	252	200	188	211	208	1,259	24¼	8	5	5
H. Battersby : White Leghorns ..	219	135	240	224	229	206	1,253	25¼	8	6	6
M. McInnes : White Leghorns ..	240	*143	180	248	211	224	1,246	25¾	8	4	3
P. R. Barsby : White Leghorns ..	214	191	179	217	225	213	1,239	26¼	7	14	6
F. S. Longley : White Leghorns ..	175	196	178	244	206	234	1,233	26¼	8	3	11
H. W. T. Hambly : White Leghorns	225	186	226	206	191	194	1,228	25	7	13	9
B. L. Blake : White Leghorns ..	228	40	205	284	221	240	1,218	25	7	18	7
K. G. Cobcroft : White Leghorns ..	135	216	198	212	202	248	1,211	27¼	7	16	7
C. H. Floyd : White Leghorns ..	224	179	218	201	237	148	1,207	25¼	7	9	10
A. Campbell : White Leghorns .	†138	198	227	178	237	228	1,206	24¼	7	13	6
J. Westmacott : White Leghorns ..	130	228	188	239	242	175	1,202	26¾	7	15	8
C. Leach : White Leghorns	†234	199	185	210	236	134	1,198	25	7	11	1
H. L. Abrook : White Leghorns ..	76	144	249	211	254	262	1,196	25½	7	19	10
Lee & Lenney : White Leghorns ..	207	237	135	230	190	183	1,182	27¾	7	10	7
G. N. Mann : White Leghorns ..	190	209	111	197	253	204	1,164	26¼	7	15	5
G. L. Atwell : White Leghorns ..	213	198	174	159	194	222	1,160	26¾	7	1	7
H. J. Evans : White Leghorns ..	123	204	182	227	252	*158	1,146	27	7	5	5
A. Greentree : White Leghorns .	206	243	191	131	206	162	1,139	26	7	8	0
Watson & Stepney : White Leghorns	155	237	202	160	183	180	1,117	25	7	8	2
A. J. Williams : White Leghorns ..	213	205	99	252	214	133	1,116	25¾	7	5	9
H. W. Starling : White Leghorns ..	141	193	172	188	206	*206	1,106	26	7	3	9
Anderson Bros. : White Leghorns ..	227	168	235	218	183	64	1,095	25	7	0	1
H. A. Duncan : White Leghorns ..	165	‡226	109	204	206	174	1,084	24	6	17	9
J. F. Rankin : White Leghorns ..	*178	214	228	136	199	*101	1,051	25¼	6	15	11
H. Holmes : White Leghorns ..	*154	227	158	188	231	80	1,038	26¾	6	17	5
E. H. Shipp : White Leghorns ..	194	245	200	162	225	†1	1,027	26¾	6	16	4
M. Mulcahy : White Leghorns ..	71	195	163	180	192	224	1,025	25	6	9	9
D. Sutton : White Leghorns . ..	156	*...	*164	229	203	226	978	‡23½	6	10	11
D. Meldrum : White Leghorns .	10	225	152	155	153	108	803	26	5	[illegible]	0
			Standard Heavy Breeds.								
W. M. Mulliner : Black Orpingtons	296	244	147	191	238	215	1,331	26	9	4	4
W. Townsend : Langshans .. .	177	214	204	176	210	‡254	1,235	24	8	4	7
H. D. Angwin : Black Orpingtons ..	*201	†165	170	161	182	244	1,123	28¼	7	10	7
J. Every : Langshans .	223	*72	*147	223	238	196	1,099	25¾	7	10	2
J. Waterhouse : Rhode Island Reds	182	*162	121	190	116	*6	777	26	5	0	10
			Standard Light Breeds.								
D. McAlpine : White Leghorns ..	269	216	187	175	226	175	1,248	26	8	1	1
Hilder Bros. : White Leghorns ..	193	216	242	252	214	107	1,224	27	8	8	4
H. P. Christie : White Leghorns ..	160	199	205	211	200	209	1,184	26	7	11	11
A. Benson : White Leghorns ..	243	100	198	156	*169	221	1,087	27¼	7	8	10
D. Beveridge : White Leghorns ..	164	169	136	227	82	103	881	24¼	5	17	1

* Signifies bird dead or withdrawn and score retained.
† Signifies bird replaced and previous score struck out.
‡ Signifies eggs are under the prescribed weight of 24 oz. per dozen.

eggs).

Apiary Notes.

W. A. GOODACRE, Senior Apiary Instructor.

IN the season now closing the heaviest surplus of honey was obtained on the coastal areas. In inland districts the drought conditions, bush fires, and a poorer prospect on the flora were responsible for a lower average production. During the spring a fair quantity of honey was extracted, and a number of apiarists obtained up to 100 lb. per colony, but in the summer and autumn the dry conditions had a serious effect on the remaining flowering flora of the inland areas.

Wauchope Apiary.

Following a very fair season in 1924-5, an exceptionally progressive time was experienced this season in the above apiary. The average production was in the vicinity of 240 lb. per colony, which is very good for a coastal area. The honey, too, was of a good average quality. Early in the season the tallowood (*E. microcorys*), and clover flowered nicely, being followed by ironbarks (*E. creba* and *E. paniculata*). Bloodwood (*E. corymbosa*) flowered during the autumn, acting as a stimulant for brood rearing and providing ample stores for winter. This is the first season since the establishment of the apiary at Wauchope that tallowwood has given a surplus, for in the past it has flowered fairly regularly every season, but has only provided a good stimulant for brood rearing. This tree evidently requires some exceptionally favourable winter and spring weather to allow of the best in nectar secretion.

Imported Bees.

The Department has three varieties of imported bees under test at the Government Apiary, namely, Italian, Cyprian, and Carniolan. The imported Cyprian queen was obtained through a Western Australian apiary, and the Carniolan and Italian were imported by the Department. The test not only consists of the pure strain, but various crosses between the varieties are also being tried out. We should have some interesting results next season, when we hope to have the tests completed. It is not intended to carry out any serious distribution of the Carniolan or Cyprian strains until we are sure of the results of the tests The work amongst the various types of bees is very interesting, as each has its different characteristics.

The Honey Market.

Although no real shortage on the market for honey this season can be anticipated, we expect to find, especially during the winter months, a very firm tone. There was a fair quantity held over from the bumper harvest of the past season, but the distribution has improved, principally owing to co-operative efforts. We are also finding better methods of putting the product before buyers, and apiarists are responding to the agitation for improved

preparation. In response to practically every inquiry and in circulars, co-operative societies give the following advice :—"Case all honey—Use only screw caps—Use grading labels (supplied free)—Clean tins thoroughly before filling—Do not use kerosene tins—Before consigning, write for advice and send samples—Send only quantities advised and help to keep away glut."

A blending plant is being constructed at the Producers Distributing Society's headquarters, and this should be an acquisition to the industry, for while a number of our honeys do not meet ready inquiry when kept separate, they are often of much value for blending purposes.

The Wintering of the Bees.

The fine rains we have experienced during the autumn have improved the prospect for successful wintering of the bees in many inland places. In the cooler parts, the rain came a little too late, and the bee-farmer will need to exercise care in providing comfortable winter quarters, and especially in early spring management. While a weakened colony, if made compact in a good hive and given stimulative feed during moderate weather in the spring, has a good chance of pulling through, a colony which occupies only one or two combs, and is left to look after itself in a three- or four-storied hive, has not much chance. It is surprising what can be done with weak colonies when care is given them in their early spring work.

The manner in which the bees are established in their winter quarters on the coastal areas is generally ideal. The late flow of honey has provided ample stores, and a good cluster of young bees is evident from such stimulating conditions.

Copper Carbonate as a Bunt Preventive.

The effect on germination of the dry copper carbonate treatment of seed wheat for bunt prevention was the subject of an interesting departmental experiment during the course of the last Royal Show. A good quality sample of Federation was hand picked. One portion was treated with dry copper carbonate on 9th March, a second portion pickled with the standard 1½ per cent. copper sulphate solution on 12th March, and a third portion was treated with a similar bluestone solution on 26th March. The three lots of seed were sown on 27th March under conditions conducive to maximum germination.

The seed treated by the dry method germinated at the rate of 94 per cent.; the bluestoned seed sown the day after treatment gave a 77 per cent. germination, and the seed which had been treated with bluestone a fortnight previous to sowing gave a germination of only 63 per cent.

The seed treated by the dry method germinated four days ahead of the other two lots, and the plants presented a considerably more even appearance. Assuming that the same control of bunt is afforded by the dry treatment (an assumption compatible with farmers' and departmental experience), the figures say much for the copper carbonate method, and especially for its utility where an interval elapses between treatment and time of germination.

Poultry Notes.

May.

JAMES HADLINGTON, Poultry Expert.

If the breeding pens have not already been mated up no time should be lost in completing this work. As a matter of fact, eggs should be saved for setting before the end of the month, so that a start can be made with incubation from the first week in June. With heavy breeds in particular it is most desirable that an early start should be made. With regard to light breeds, such as Leghorns, their eggs, too, should be set to some extent, so that early hatched chickens will be available as breeders this time next year.

The case for early hatching has been so often stressed in these Notes that it would be almost superfluous to reiterate it, but it cannot be too often emphasised that the farmer who neglects to hatch a portion of his stock early is heading for trouble in respect of size and physique in his flocks. Of course, the tendency of early hatched Leghorns to break into a partial moult during the late summer and early autumn months is well understood. Possibly, as far as a purely laying stock is concerned, chickens hatched in August and the first two or three weeks in September give the best results, but the poultry farmer who does not visualise his whole field of operations and work for the best all-round results will soon find that he will lose ground in egg-laying ability, and will have a higher mortality in rearing and among the adult birds. In this connection portion of my lecture at the recent Royal Agricultural Society's show will be of general interest, as it deals mainly with the selection of breeding stock in a way that will doubtless be helpful.

Better Poultry.

In introducing this subject I said :—"We are apt to pride ourselves upon the fact that as far as egg-production is concerned we are in the van, and therefore all is well. Certainly our egg records in competitions compare most favourably with any in the world and are ahead of most countries. But allowing all this, we are, in my opinion, a good deal behind possibilities, both in competitions and on our farms.

"Referring to performances in competitions, I want to say that a much higher general average of production would result from a better selection of the pullets sent to these tests. I see no reason why this average could not be raised to 18 dozen, instead of between 16 and 17 dozen per hen as at present, and further that the birds capable of doing this are on the farms. If this is admitted we can only assume that the poor selections made by competitors are responsible for an average lower than the possible. It is not so much that we lack hens putting up high records as that the lower tallies pull down the average. This is where the poor selection comes in. Selection is the secret of success in competitions as well as breeding. In this regard it is

feared that many breeders who enter the competitions make their selec co- on the assumption of inherited high fecundity, and neglect the fa e only selection on conformation.

Fig. 1.—A Typical White Leghorn Hen.

Fig. 2.—This Hen Lacks Symmetry, is Whippy in Tail, and Coarse in Head Points.

Fig. 3.—This hen is Shallow in Body indicating Lack of Constitution.

Fig. 4.—A Coarse Hen of Bad Type; inclined to put on Flesh rather than Lay Eggs.

Note the coarseness of the head.

"The same thing is in evidence on many farms in respect of breeding stock. Selections are made purely on blood lines, without regard to the quality of the birds being penned. This action follows upon the idea that 'like produces like,' but with regard to poultry it is not always so, because

no matter what the breeding of the birds, only continual selection of the best specimens can be relied upon to perpetuate the qualities for which the breed stands.

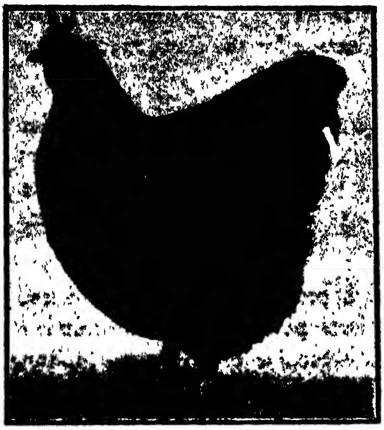


Fig. 5.—A Typical Black Orpington Hen.

Note the "cobby" outline and depth of this hen in comparison with the others on this page.

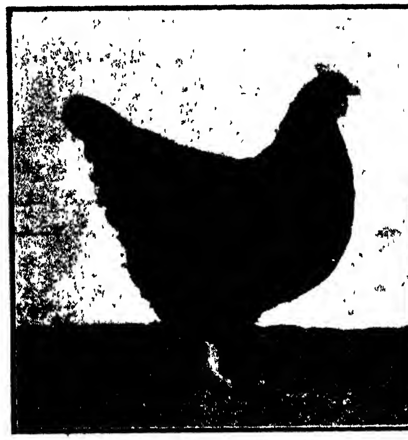


Fig. 6.—This Hen shows some Falling Away from Type

She is less "cobby," too long in the back, and shallow in body

Fig. 7.—Lacking Symmetry and Character.

While more "cobby" than Fig. 6, this bird is still on a descending scale as regards quality.

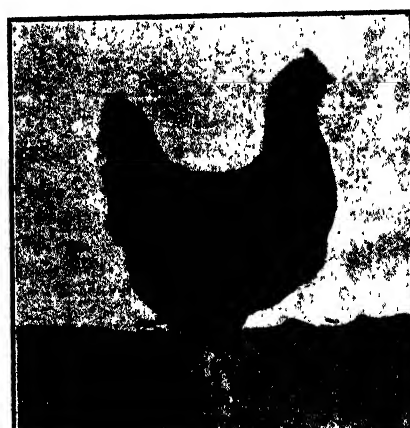


Fig. 8.—Figures as an Orpington.

Altogether lacking in type and character for the breed, and in fact nothing more than "a black hen."

"If, with all the efforts that have been put forth in breeding on blood lines during the last twenty-five years, we are still producing so many birds of low-laying ability, it is quite evident that something is lacking—and undoubtedly that something is skill in selection of the right specimen to breed from.

"To come to the average of production on the farms. The highest flock average I know is 170 eggs per hen, and there are but a comparatively small number of farms where an average of 160 is reached. There are more round about 140, and very many, it is feared, do not rise above 120. Below that again are the obvious failures who will not be long in the industry. These, of course, bring our general average of production for the State much below what it might be.

"The outstanding fact is that at present our general average of production is almost stationary, and as is pointed out in my comments on the test just concluded, the only real impetus secured in general average production followed upon a regulation which demanded better physique in the birds entered for competition.

"One thing is certain, breeding for high production has not produced general results commensurate with the efforts put forth in this direction. We know, for instance, that some hens are capable of laying up to, say, 345 eggs, but very few do so. We also know that many hens are capable of laying between 250 and 300 in 365 days, while a still greater number put up over 200 eggs. But no natural law or method has yet been discovered that can be relied upon to bring about the transmission of any given rate of production, high or low. Yet we know that continuous breeding for high production does improve that quality, as would be the case with any other factor which the breeder sets out to accentuate.

"Why then is it that our general average production remains comparatively low? To throw some light on the question is the purpose of the accompanying illustrations. It is desired to show that the basis of all our efforts must be stamina and physique, in order to sustain inherited tendencies to high production. This is both a matter of breeding and of rearing. All the potential gains in breeding can be lost in the rearing. Blood lines are no certain guide to high production, but selection from birds so bred is the only means to the attainment of this quality.

"We can breed from high-producing hens mated to their like in males, and the result will be some high and some low producers. In like manner, we can breed from low layers and obtain a similar result. In birds bred, then, according to blood lines and without selection we arrive at a levelling-up process which is very largely responsible for disappointments met with in respect of the goal of high production."

All this brings us to the question of good, bad, and indifferent specimens and should be evidence of the necessity for every breeder knowing the type and character of the breed he keeps, in order that he may be able to make proper selections.

The accompanying illustrations will perhaps assist poultry farmers in this matter.

Orchard Notes.

May.

W. J. ALLEN and W. LE GAY BRERETON.

Even in the late apple and pear districts, growers will have practically completed their harvesting by this month.

Before starting on the winter work, the packing shed should be given a complete cleaning up. Any cases that have been used to hold fruit during the season should be submerged for not less than three minutes in boiling water, and packing benches and stands should be washed down with boiling water containing a disinfectant. This should be done not only to catch any codlin moth grubs that have emerged from infested fruit, but also to check the accumulation of such fungous diseases as ripe or bitter rot. Any crevices in the benches or the packing house appointments should be raked out with a wire, and any bagging that has been used on the benches, &c., burned to destroy any harbouring codlin grubs. Where possible, opportunities should be taken in wet weather during the winter to make all packing or other sheds in which apples and pears have been handled moth proof.

Pests.

It is advisable to leave the bandages on apple and pear trees till towards the end of winter, as often after winter rains and cold, codlin grubs will shift from other hiding places to the more snug shelter of the bandages, where they can be caught and killed.

Where woolly aphis has made headway unchecked during the busy time of the picking season, the trees should be sprayed with tobacco wash or one of the commercial extracts. When spraying for aphis use a high pressure, not under 180 lb., and hold the nozzle close to the affected parts. In other words, use a "drenching" spray, not a "mist spray," in order to break up the clusters. Spraying in this manner uses a large percentage of spray per tree, and if the aphis is thick on big trees a pool will accumulate around the butt, and for this reason it is preferable in treating for woolly aphis to use a harmless spray such as tobacco wash rather than an oil spray.

Where citrus trees are infested with scale insects which have not been dealt with earlier, they can still be fumigated, for a satisfactory kill can even yet be obtained, but the red scale, though killed, may not crack off the fruit at picking time. When fumigating in the winter, care should be taken not to carry out the work when the temperature falls below 40 degrees Fah. All the so-called blackthorn which thrives in the coastal districts should be destroyed when growing near citrus orchards, as it acts as a host for the white wax scale, and is, therefore, a source of infection.

Planting.

If the land is well prepared and in good moist condition, neither too dry nor too wet, young deciduous trees that have lost their foliage can be planted now. When the trees are available, and are dormant, it is sometimes convenient to get this work through early.

In districts liable to winter frosts, even though only slight, citrus trees planted within the last three or four years should be protected by bushes, sorghum stalks, or bagging.

Surface Drains.

When laying-out for planting fruit-trees on a slope, provision should be made to prevent washaways during heavy rains. Water from the slope above can be prevented from flowing on to the cultivated area by suitable drains, but if on wide slopes of cultivated ground, provision must also be often made for the rain that falls within the area, and wide, shallow, open drains must be made at an even, slight grade to carry the surplus water off during storms.

Too often the making of such drains is left till after planting is completed, and then often forgotten till bad washaways occur. The planning of these drains should be done beforehand, and they should be constructed as soon as the land is first broken up to make it safe from washes at once, and also because often the position of the drains will considerably control the lay-out for the trees.

Leaflets on laying-out and planting are obtainable from the Department of Agriculture, Sydney.

Other Work.

Provided the land is not too soft from rain, it is a good time to cart out to the trees any farmyard manure or other refuse that will rot and form humus, or to carry out any re-soiling or drain making that is necessary.

Where large areas are to be pruned, a start can be made this month on such deciduous trees as peaches or Japanese plums, which lose their foliage early, but if one is not pressed for time it is better to wait until next month.

The Function of Co-operative Marketing.

The chief aim of co-operative marketing is not to obtain for the producers the profits of independent merchants, but rather to contribute to and effect better merchandising methods than previously were employed in marketing farm commodities. Proper grading of farm products and standardisation of grade and pack, which are essential to efficient merchandising, can be effected much more readily when farmers are organized into groups. Standardized grades facilitate trading, create confidence, and stabilize market conditions.—Report of the Secretary of Agriculture, Washington, U.S.A.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat :—

Canberra	Manager, Experiment Farm, Condobolin. Chaffey Bros., Nemingha House, Tamworth. J. Watson, Merriwagga. T. R. Jones, "Birdwood," Forbes. Quirk and Everett, "Narrawa," Cobbora-road, Wellington. Hobson Bros., Cunningar.
Cleveland	W. Burns, "Goongirwarrie," Carcoar. Manager, Experiment Farm, Bathurst.
Currawa...	Quirk and Everett, "Narrawa," Cobbora-road, Wellington. Hobson Bros., Cunningar.
Federation	Quirk and Everett, "Narrawa," Cobbora-road, Wellington. T. R. Jones, "Birdwood," Forbes. G. L. McLaren, "Locksley," Nora Creek, Cumnock.
Firbank	Manager, Experiment Farm, Condobolin. Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
Florence	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.
Gresley	Manager, Experiment Farm, Condobolin.
Hard Federation	Hobson Bros., Cunningar.
Improved Steinwedel	Hobson Bros., Cunningar.
Rymer	Chaffey Bros., Nemingha House, Tamworth.
Union	G. L. McLaren, "Locksley," Nora Creek, Cumnock.
Waratah	Hobson Bros., Cunningar.
Yandilla King	Quirk and Everett, "Narrawa," Cobbora-road, Wellington.

Oats :—

Algerian	C. Bennett, Forbes-road, Cowra. J. Lyne, Farm 1636, Yenda.
Mulga	Manager, Experiment Farm, Condobolin. C. Bennett, Forbes-road, Cowra.
Reid	J. A. Reynolds, Ben Lomond.

Broom Millet :—

White Italian	W. Lye, Loomberah.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society.	Secretary.		Date.
Trangie P. A. and H. Association	A. K. Butter	May	20, 21
Warren P. and A. Association	O. C. Tompson	,,	27, 28
Bonalbo A. and I. Society	W. G. E. Johnston	,,	27, 28
Peak Hill P. A. and H. Association	T. Jackson	July	27, 28
Tullamore P. and A. Association	C. S. Pryke	Aug.	4, 5
Brisbane National	....	,,	9 to 14
Trundle P. A. and H. Association	H. E. Mullins	,,	10, 11
Condobolin P. A. H. and I. Association	....	,,	17, 18
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	,,	24, 25, 26
Bogan Gate P. and A. Association	J. Egan	,,	25
Gilgandra P. and A. Association	D. Christie	,,	24, 25
Cootamundra P. A. H. and I. Association	W. W. Brunton	,,	31, Sept 1
Grenfell P. A. H. and I. Association	T. Wenham	,,	31, ,, 1
Parkes P. A. and H. Association	L. S. Seaborn	,,	31, ,, 1
Forbes P. A and H Association	E. A. Austen	Sept.	7, 8
Young P. A. H. and I. Association	T. A. Tester	,,	7, 8, 9
Gunnedah P. A. and H. Association	M. C. Tweedie	,,	7, 8, 9
Lake Cargelligo P. A. H. and I. Association	J Costella	,,	8
Ganmain A. and P. Association	C. C. Henderson	,,	14, 15
West Wyalong P. A. H. and I Association	T. A. Smith	,,	14, 15
Cowra P. A. H and I. Association	E. Todhunter	,,	14, 15
Manildra P and A. Association	J. Longley	,,	14, 15
Junee P. A. and I. Association	G. W. Scrivener	,,	14, 15
Northern A Association (Singleton)	S. Griffits	,,	15 to 18
Melbourne Royal	....	,,	16 to 25
Lockhart A. and P. Society	E. D. Arnold	,,	21, 22
Murrumburrah P. A H. and I. Association	W. Worner	,,	21, 22
Canowindra P. A. H. and I. Association	J. Rhue	,,	21, 22
Temora P. A H. and I. Association	A D. Ness	,,	21, 22, 23
Boorowa P A H. and I. Association	W. Thompson	,,	22, 23
Henty P. and A. Society	J. Lovell	,,	28, 29
Barellan P. A. H. and I. Association	J. Doh rty	,,	29
Barmedman P. A H. and I. Association	W. Pemberthy	,,	29
Hillston P. A. H. and I Association	J. Pevers	Oct.	1
Ardlethan P. A. H. and I. Association	R. L. Neill	,,	6
Quandialla P. A. H. and I. Society	V. G Talbot	,,	6
Hay P. and A. Association	R. Eagar	,,	6, 7
Narrandera P. and A. Association	W. H. Canton	,,	12, 13
Ariah Park P. A. H. and I. Association	J. McInness	,,	13
Carcoar, H. C. & A. Association	J. Brady	,,	13
Griffith P. A. H. and I. Association	M. E. Sellin	,,	19, 20

1927.

Kiama A. Society	G. A. Somerville	Jan.	25, 26
Newcastle A. H. and I. Association	E. J. Dann	Feb.	15 to 19
Central New England P. and A. Assoc. (Glen Innes)	G. A Priest	Mar.	8, 9, 10
Manning River A. and H. Association (Taree)	R. Plummer	,,	9, 10, 11
Camden A. H. and I. Society	G. V. Sidman	,,	31, Ap. 1, 2

Agricultural Gazette of New South Wales.

Fodder Conservation Competitions.

THE ROYAL AGRICULTURAL SOCIETY'S CHAMPIONSHIP.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

THE great necessity for the conservation of fodder in anticipation of periods of shortage is generally recognised, and the initiation of this competition by the Royal Agricultural Society will serve as a stimulus to stockowners to adopt this form of insurance for the safety of their stock, and will focus attention on the best methods to be adopted for the adequate protection of the stored fodders to preserve them from deterioration.

Local competitions were conducted by three agricultural societies, viz., Cootamundra, Narromine, and Wagga, and the first-prize winners of these district competitions became eligible for the Championship Competition conducted by the Royal Agricultural Society. While the number of societies that conducted competitions may be regarded as small, yet it is considered that the competitions have been successfully launched and the keen interest and enthusiasm displayed is sufficiently encouraging to justify confidence as to their future popularity and usefulness.

The conditions and scale of points for judging the competition were as follows :—

Fodders eligible for competition to be :—

Concentrates (including all grains) or roughage (as hay, &c.—e.g., lucerne, oaten, wheaten, barley, clover, grass, or silage) and any other fodder suitable for conservation.

SCALE OF POINTS.

1. *Suitability and Quality of Fodder*	35 points.
Judged (*a*) according to the suitability of fodder or combination of fodders for the purposes for which they are required, and (*b*) as to appearance, apparent palatability, and nutritive values.	
2. *Location and Protection*	25 points.
(*a*) Location of the site, having regard to fire, flood, economy in feeding, and general access, and	
(*b*) Protection from weather, pests, and general deterioration.	
3. *Cost of Production*	30 points.
To be based on relative cost of production and value for the district.	
4. *Carrying Capacity*	50 points.
Quantity and feeding value of fodder suitable for stock normally carried, and for period necessary to maintain same.	
5. *Marketing Possibility and Originality of Method of Conservation* ...	10 points.
Total	150 points.

* Text of the judge's report in the above competition.

Judging, which was commenced at Wagga on 19th March and completed at Narromine on the following day, resulted in the following awards :—

Competitor.	Suitability and Quality of Fodder.	Location and Protection.	Cost.	Carrying Capacity.	Marketing Possibility, &c.	Total.
1. A. Brunskill	34	24	24	42	8	132
2. Gerelgambeth Ltd. ...	30	20	23	49	7	129
3. W. H. Gainsford ...	26	16	23	42	7	114

Mr. Brunskill's "Allonby" property is 4,816 acres in area, and is situated at Forest Hill near Wagga, with the exception of 200 acres at Borambola, which is used as a feeding depot. Of this area, 1,200 acres are under lucerne, 150 acres is usually sown to kale mixed with a little Japanese millet as a fodder crop, 400 acres to wheat, 400 acres to oats, and 400 acres are fallowed. The remainder of the property is used for grazing. The whole of the cereal crop is harvested for hay, and the three-year rotation (fallow, wheat, oats) is adopted.

The following is the fodder conserved at "Allonby":—

Kind of Fodder.	Year of Harvest.	Quantity.
		Tons.
Silage (7 pits)	1915	1,400
Silage (2 pits)	1925	350
Wheaten hay (5 stacks)	1923	215
Wheaten hay (9 stacks)	1924	450
Wheaten hay (3 stacks)	1925	165
Oaten hay (8 stacks)	1924	480
Oaten hay (5 stacks)	1925	275
Lucerne hay (5 stacks)	1920	200
Lucerne hay (2 stacks)	1925	55
Cereal chaff	...	37
Oats	...	13
Total		3,640

The outstanding feature was the surprisingly excellent quality of this enormous reserve of fodder, practically the whole of which could be classed

as "prime," indicating sound judgment in harvesting crops at the correct stage of growth, and excellent management in the treatment of the produce from the time it left the binder or mower. The silage was conserved in pits and was all made from the first "cut" of the season from the lucerne crops. Barley grass is usually prevalent in the first growth of lucerne each year, and for this reason ensilage is the best form of conservation for the first cut. By the methodical system adopted at "Allonby," 40 tons of green lucerne are pitted per day. September is the month favoured for sowing lucerne, as the autumn-sown crops are invariably fouled by barley grass, and every second year the lucerne paddocks are scarified and receive a top-dressing with superphosphate at the rate of 1½ cwt. per acre.

The silage pits are well protected with a covering of three feet of earth, which is formed with a good "crown" to throw off rain water, and drains are constructed on the hard ground at the sides of the pits at least a foot from the edge. As the result of this protection the silage opened up with practically no waste and of very high quality, even though the bulk of it had been ensiled for eleven years. No better demonstration is required to prove that, provided that the entrance of water and air is prevented, this succulent form of conserved fodder will retain its quality indefinitely without deterioration, and moreover is safe from damage by fire, stock, and pests.

The lucerne hay was leafy and of good colour, and the stacks were well roofed and thatched.

The stacks of cereal hay were splendidly built on dunnage of timber, and those which it is intended to hold over are well thatched and protected from depredations of mice by a galvanised-iron fence sloping outwards, and from stock by barbed wire. In consequence of this effective protection there was practically no waste and the hay was of prime quality, even that made in the wet hay-season of 1924 being of excellent colour and feeding value. The varieties of wheat favoured for hay were Turvey, Warden, Baroota Wonder, and Zealand, and the only variety of oats grown is Algerian.

The stock normally carried on "Allonby" consists of 6,400 sheep and 50 horses, and it will be seen that, with his reserves of fodder and lucerne paddocks, Mr. Brunskill is in a very sound position to make the maximum returns from his property. As regards fodder conservation he has set a high standard, well worthy of emulation.

The second prize is awarded to fodder conserved on "Gerelgambeth," a property situated at Illabo and owned by Gerelgambeth Limited, of which company Mr. G. R. B. Williams is managing director. The total area is 1,632 acres, of which 180 acres are under lucerne, and 70 acres have just been sown with rape and oats as a green fodder crop. Last season 230 acres were sown to wheat and 200 acres to oats; there are 286 acres of fallow and the balance is pasture land.

The number of stock usually carried here is 1,750 sheep, including approximately 700 which are marketed as sucker lambs, 28 horses, and 8 cattle.

The conserved fodder consists of—

Kind of Fodder.	Year of Harvest.	Quantity.
		Tons.
Silage (2 pits)	1923	180
Wheaten hay (3 stacks)	1924	290
Wheaten hay (2 stacks)	1925	150
Oaten hay (2 stacks)	1924	150
Oaten hay (1 stack)	1925	100
Baled oaten hay (1 stack)	1925	40
Lucerne hay (3 stacks)	1924	100
Baled lucerne hay (2 stacks)	1924	110
Cereal chaff	...	30
Total		1,150

The silage was all made from lucerne conserved in pits excavated on a slope, and covered with 3 feet of earth. The sample of silage was good, with very little waste.

The cereal hay was in large well-built stacks of 70 to 120 tons. The hay was of prime quality, with the exception of the oaten and some of the wheaten hay harvested in 1924. Most of the stacks were thatched, a foundation of straw and rejected sheaves being used to prevent deterioration by moisture from the ground. No protection against depredations of mice was provided, but the weight of hay in the stack was depended upon to prevent the entrance of mice. The varieties of wheat used for hay were Warden and Purple Straw, and Algerian was the variety of oats.

As regards carrying capacity, Mr. Williams holds an unassailable position; the quantity of fodder stored is not only sufficient to tide his stock over a severe drought, but there is a surplus that could be disposed of to advantage during drought periods.

Mr. Gainsford's property "Yarran Farm" at Narromine has a total acreage of 1,100 acres, of which 400 acres are usually sown to cereals and 300 acres are fallowed, the balance being grazing land. His stock consists of 500 sheep, 21 horses, and 14 cattle. The following amount of fodder is stored on "Yarran Farm":—

Kind of Fodder.	Year of Harvest.	Quantity.
		Tons.
Silage (3 pits)	1924	230
Wheaten hay (3 stacks)	1925	60
Oaten hay (5 stacks)	1925	110
Barley	1925	22
Total		422

The silage was made in pits from a wheat crop which had become fouled with weed growth and rendered unprofitable to harvest for hay or grain.

The pit was covered with 3 feet of earth, but sufficient attention had not been given to the prevention from entry into the pit, of rain water by the formation of a good "crown," the construction of side drains or the filling in of cracks on the surface. The silage inspected was a good sample, and was in sheaves as dropped by the binder. By leaving the bands on the sheaves, the emptying of the pit and the feeding of the silage are facilitated. The variety of oats used for hay was Guyra ; as the wheaten hay had been harvested from headlands and tracks, it consisted of several varieties. The barley was of the malting type, but as it had been threshed too close for malting, it was reserved for feeding purposes.

It is considered that in cereal growing districts more attention might be given to the storage of oats as a fodder reserve. It is one of the most valuable and easily distributed feeds in drought periods.

The scale of points adopted for the judging of this competition was on the whole satisfactory, although there was some difficulty in determining the basis upon which points should be allotted under the heading of "carrying capacity." Consideration was given for any surplus fodder in excess of the requirements for maintenance over a severe drought period of the stock normally carried, as it is contended that credit is due to any factor that will minimise losses during drought periods, whether it be on the owner's property or elsewhere. The quantity of fodder stored per acre was also taken into consideration: otherwise an undue advantage would be given to certain competitors—for instance, those who specialise in hay-growing and carry comparatively few stock.

The Royal Agricultural Society is performing a national service in instituting fodder-conservation competitions, and thus encouraging the storage of fodders on the properties where they are produced and will be required. Fodder reserves on a property are not only an insurance against drought losses, but they enable stockowners to keep their properties stocked to the full carrying capacity.

THE NARROMINE COMPETITION.

R. G. MAY, H.D.A., Manager, Bathurst Experiment Farm.

For the competition conducted by the Narromine P. A. and H. Association, there were seven entries. The conditions and scale of awards were the same as in the Championship above.

The scale of points under which the awards are made are comprehensive and should, when properly applied, act as an excellent guide to the correct storage of conserved fodder. The following remarks indicate broadly the features in the competition to which competitors could give greater consideration.

As regards suitability and quality of fodder, including palatability and nutritive value (35 points), the climatic limitations of the district have a bearing upon the type of fodders conserved. Except upon the river frontages, lucerne hay and maize grain cannot reasonably be produced, and attention must therefore be concentrated upon other high yielding crops most suited to the district. A mixed diet is more palatable and nutritious to stock, and a balanced ration more easily arranged than is the case when only one type of fodder is stored—further, the needs of different classes of stock are more readily catered for. Thus, the conservation of fodders in the shape of silage, cereal hay, and grain in conjunction is most profitable, and should be the aim of all stockowners in the district.

The location and protection of the stored fodder (25 points) was carefully considered in most instances, though considerable improvement could be made. The future value of the fodder is so high that a comparatively small expenditure should be incurred in protection from fire, weather, mice, stock, &c., by firebreaks, thatching or placing under cover, mouse-proof surroundings and protective fences, respectively. The covering of silage pits should be examined, especially while the silage is settling, to fill up any cracks appearing, and to prevent the covering soil from sinking below ground level. The depth of soil covering a silage pit need not exceed 18 inches to 2 feet and a good crown should be maintained to throw off heavy rains. The location of the stored fodder should also be such that the expense in making it available to stock would be reduced to the minimum; it should also be in close proximity to permanent water and good shade as far as possible.

As a business proposition, the cost of production (30 points) has not been given the attention that it should receive. Apart from determining the cost value of the fodder stored, the indirect benefits to be gained, particularly by enabling the most profitable methods of production to be undertaken, are very great. I suggest that this important, yet much neglected item of farm business be given closer attention.

The carrying capacity of a holding (50 points) is a most important feature. The policy of adding to reserves of fodder permits of increasing the carrying capacity of a holding with the consequent increase of both annual turnover and of capital value. The fodders stored should be sufficient to keep the stock in good condition during a lengthy period of scarcity until natural pastures are again sufficient to maintain them properly. The stored fodders should likewise be sufficiently ample to permit the feeding of stock before they begin to lose condition. The storage of mixed fodders is an important factor in determining the carrying capacity of a holding, stock responding well to a mixed, balanced diet, but becoming stale on a restricted diet. Nature provides a variety of food in natural pastures, and the same objective should be aimed at in conserving fodders.

Marketing possibility and originality of method of conservation (10 points) requires consideration from a landholder, since, should surplus products require to be sold, ease and possibility of profitable sale should be possessed

by the fodder concerned. In the event of the sale of a property, or should financial assistance be required, the readily convertible product possesses the highest value. The heading "originality of method of conservation" makes room for ingenuity in adopting methods of storage which will draw attention to cheap and efficient methods suitable to the class of fodder to be conserved.

The winner of the competition, Mr. W. H. L. Gainsford of "Yarran Farm," is entitled to compete in the Royal Agricultural Society's Championship Competition. On his property of 1,100 acres, there were conserved 230 tons of good quality silage, 110 tons oaten hay, 60 tons wheaten hay, and 1,000 bushels of barley grain, the whole to act as a fodder reserve for 500 sheep, twenty-one horses, and fourteen cattle. The variety of fodders, their quality, and quantity are good features in the policy followed by the winner. A comparison between the value of pit and stack silage was available on this property, clearly showing the wisdom of adopting suitable methods of storage. A 70-ton stack of silage was inspected and found to be of medium to inferior quality, with a high percentage of waste and with invasion by mice. The pit silage, amounting to 230 tons, was of splendid quality, safely and conveniently stored, and free from possible damage. The oaten hay, mainly of Guyra variety, was sweet, clean, and of good colour, the mixed wheaten hay being similarly of good quality. The barley grain was bright, clean, and plump. In conjunction, these mixed fodders will prove of splendid feeding value, the owner appreciating his forethought when the necessity to use them arises.

Mr. J. H. Drew, of "Little Farm," well deserved his success of second place. On a farm of 458 acres, there are carried 300 sheep, nineteen horses, and eight cattle. As a reserve, there are 350 tons wheaten silage, 160 tons wheaten hay, and 6 tons straw, all of splendid quality. The proximity of the stacks to one another, which would result in the loss of all should fire occur, and lack of grain reserves militated against this entry scoring better.

Mr. Charles Cullen, of "Nellie Vale," secured third place with 100 tons of silage, 25 tons prime wheaten hay and 25 tons good quality oaten hay stored on a property of 115 acres. The stock consisted of thirty-four cattle and twenty-five horses. Being a dairying proposition, a different feature was introduced in comparison with the other farms entered in the competition.

Reviewing the competition, there are several suggestions which could be followed with advantage by competitors in future competitions. A marked weakness was apparent in the protection of the conserved fodders from damage. Mouse-proof fences of plain galvanised-iron should be provided around stacks, which should be thatched and spaced for safety in the event of fire, with suitable firebreaks properly cared for. Stock-proof fences should also be erected around stacks where required. Suitable mouse and damp-proof tanks or bins for the protection of grain against mice and weevils are

necessary. Better attention to the covering of pit silos is recommended; in several instances the settling of silage had created large cracks in the covering soil, which had not been attended to and which might result in damage to the valuable contents stored. The selection of storage sites for all classes of fodder, conveniently placed with regard to water and shade, and to labour in feeding the stock, is very important.

Competitor.	Suitability and Quality of Fodder.	Location and Protection.	Cost of Production.	Carrying Capacity.	Marketing Possibility, &c.	Totals.
W. H. L. Gainsford ...	28	20	23	43	8	122
J. H. Drew	26	19	23	40	7	115
Charles Cullen	27	20	24	35	7	113
E. R. Crawford	27	17	22	33	7	106
N. R. Beveridge... ...	25	16	23	33	7	104
Barry O'Neill	20	16	21	27	6	90
F. G. Bullock	20	16	20	25	5	86

THE COOTAMUNDRA COMPETITION.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

THE awards in this competition were as follows:—

Competitor.	Suitability and Quality of Fodder.	Location and Protection.	Cost of Production.	Carrying Capacity.	Marketing Possibility, &c.	Total.
G. R. B. Williams ...	31	20	22	49	8	130
G. G. Davidson	32	22	24	43	7	128
F. C. Roberts	28	18	22	40	4	112

Mr. Williams' property is 1,632 acres in area; 180 acres are under lucerne, 230 acres were under wheat last season, 200 acres under oats, and 286 acres in fallow. The remainder of the area is used for grazing. At present Mr. Williams is carrying 900 ewes in lamb, 150 ewe hoggets, and 700 lambs, making a total of 1,750 sheep. Horses and a few cattle are carried in addition.

Mr. Williams has almost one ton of stored fodder for every acre of land, and is in a particularly safe position as regards being able to feed his sheep during periods of drought. In fact, should a protracted drought occur he would be in the fortunate position of being able to sell a large amount of wheaten and oaten hay at drought prices. In addition he could, if inclined, buy poor sheep during the drought and feed them together with the sheep already carried on the stored fodder. Indeed, to turn the storage of such a tremendous quantity of fodder to profitable account it would be imperative

to take advantage of the drought either to sell all the surplus stored fodder, retaining little more than sufficient to carry the stock safely through the drought, or to buy poor sheep to use the fodder.

Kind of Fodder	Year of Harvest.	Quantity
		Tons.
Oaten hay in stacks	1924	150
Oaten hay in stacks	1925	100
Wheaten hay in stacks, medium	1924	170
Wheaten hay in stacks, prime	1924	120
Wheaten hay in stacks, prime	1925	150
Baled hay in stacks, oaten	......	40
Baled hay in stacks, lucerne, 1st quality ..	......	60
Baled hay in stacks, lucerne, 2nd quality ..	......	50
Loose lucerne hay in stacks	...	100
Poor quality wheaten and oaten hay ...	.....	30
Straw	.....	10
Silage in two pits (lucerne)	....	180
Bagged chaff, oaten	.....	10
Loose chaff in loft	...	20
Total		1,190

The bulk of the stacks on this property are well built, thatched with straw, and are well protected. and are intended for sale. Even had the 690 tons of wheaten and oaten hay been disposed of, the remaining fodder, viz., 500 tons, would have been more than sufficient to carry the sheep held at present through a severe drought.

Mr. G. G. Davidson has 6,400 acres of land, on which 7,500 sheep are grazed. The bulk of the fodder stored is intended for use during droughts.

Kind of Fodder	Quantity.
	Tons.
Lucerne hay (4 stacks)	30
Lucerne hay (6 stacks)	65
Lucerne hay (1 stack)	15
Wheaten hay (4 stacks)	130
Wheaten hay (6 stacks)	305
Wheaten and oaten hay (2 stacks)(poor quality)	40
Baled lucerne and wheaten hay	130
Oaten and Wheaten hay (in mouse-proof shed)	30
Wheaten chaff	10
Total	755
	Bags.
Maize in mouse-proof shed	160
Oats in mouse-proof shed	500
Total	660

Mr. Davidson has made excellent provision for carrying his stock through any drought likely to be experienced. He has taken most thorough precautions to protect the fodder from fire, rain, and mice. Most of the stacks

are mice-proof; in fact, all the stacks built recently are on mice-proof stands. Instead of covering hay stacks with iron or straw thatching, he finds it better to use tarred hessian sheets. Mr. Davidson had been careful to provide variety in the stored fodder. His experience of feeding sheep during droughts has led him to place some emphasis on this important point.

Mr. Roberts has 2,154 acres, on which he runs 3,600 sheep. He has stored the following fodder :—

Kind of Fodder.	Quantity.
	Tons.
Lucerne hay (loose)	70
Lucerne hay (baled) in sheds	140
Lucerne and oaten hay (baled)	30
Silage (lucerne) in 2 pits	100
Silage (lucerne) in 3 pits	190
Total	530
	Bushels.
Oats in sheds	100
Wheat in sheds	45
Total	145

This should certainly be sufficient to carry the stock through any drought likely to be experienced.

If the good example set by these three leading competitors was followed by the stockowners of the State, severe losses during droughts would be quite a thing of the past.

It is realised that every grazier cannot afford to store quite so much fodder as that outlined above; at the same time, if a small amount is conserved each year during good seasons no great expense would be incurred.

It is impossible to overestimate the necessity for protecting the stored fodder, particularly from mice and weather.

Pool Marketing of Agricultural Products.

According to Professor W. R. Camp, of the University of California, last year's pools marketed 48 per cent. of the tobacco crop in the United States, 8 per cent. of the cotton crop, and 10 per cent. of the wheat crops in Canada and the United States. He states that this form of organisation is either already a large factor, or is becoming important, in the distribution of milk, butter, eggs, potatoes, citrus fruit, cranberries, raisins and prunes. The development of the agricultural pool constitutes one of the great changes taking place in the system of distribution and financing. At the same time, he adds, there are some who believe that the co-operative movement, which has been growing so rapidly, is already encountering disintegrating elements which preclude a realisation of its theoretical possibilities.

Farmers' Experiment Plots.

Wheat and Oat Experiments, 1925.

Central-western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

FIELD experiments were conducted in the season just passed with the following farmers, in centres representative of the central-western portion of the State :—

Y. H. Walker, "Yamboola," Eugowra.
Chas. A. Carter, "Kikiamah," Grenfell.
H. Nealon, Quandong, *via* Grenfell.
E. Lewis, Brundah, *via* Greenethorpe.
Robinson Bros., Tallawang, *via* Gulgong.
V. D. Cox, "Burrundulla," Mudgee.
A. Rowlands, "The Pines," Neville.
G. L. McLaren, "Locksley," Nora Creek, *via* Cumnock.
William Burns, "Goongirwarrie," Carcoar.
M. F. Dalton, "Duntry-league," Orange.
A. J. Cantrill, "Canbridge," Borenore.
D. O'Neill, "Clearview," Bowan Park, *via* Orange.
C. Toole, "Hellston," Tarana.
F. Goodacre, Neville, *via* Blayney.

These centres have a variation in altitude of from 890 feet to 2,843 feet above sea-level, and an average annual rainfall of 24·20 inches to 35·26 inches. The yields obtained were very satisfactory throughout, except at Mudgee, where only 4·3 inches of rain fell for the five months prior to sowing, and an absence of spring rains in the growing period resulted in crops not worth harvesting.

The season generally was a most erratic one. Following heavy summer rains, the autumn was dry, and owing to heavy weed growth on the fallows and the frequent use of disc implements, the ground could not be sown in April or until good rain fell in mid-May. The June and July falls were very heavy and caused the soil to set firmly, partially suffocating the plants and resulting in poor stooling. Frosts and low temperatures up to the end of September greatly retarded growth, and at that time the prospects of satisfactory yields of grain or hay were not promising. With the advent of warm weather in October came dry conditions, and by the end of the month the crops were beginning to burn off. During the last two days of the month good rain fell, followed by heavier rain ten days later. The effect of these falls was extraordinary. They brought success instead of apparent failure, and were responsible for good yields of grain of excellent quality.

The Prevalence of Disease.

Fungous diseases were not very prevalent this season, the most noticeable being loose smut, flag smut, and take-all.

Flag smut was mostly present in crops sown in a dry seed-bed, and particularly in susceptible varieties, such as Federation and Canberra. The varieties showing the greatest resistance to this disease were Wandilla and Gresley.

For the last two seasons attention has been particularly drawn to the prevalence of loose or flying smut, and this season it was the most prevalent disease in the central west. Although the degree of attack in most cases was probably not more than 5 per cent., several instances of from 15 to 20 per cent. of attacks were met with. Varieties particularly susceptible are Gresley, Canberra, Currawa, and Onas.

It does not seem to be generally known among wheatgrowers that infection with this disease takes place during the flowering stage of the plant. The degree of infection depends largely on the weather conditions at that time, and is greatest in dry, warm, windy weather. As the parasite lies dormant within the grain until it germinates, it is difficult of treatment.

The value of the dry copper carbonate treatment for the prevention of bunt was strikingly evidenced again this season.

Take-all appeared rather badly in the plots at Quandong. It was the second crop on new ground, a condition which seems to favour the development of this disease.

RAINFALL for Fallow and Growing Periods.

	Eugowra.	Grenfell.	Tallawang.	Neville.	Boreenore.	Carcoar.	Bowan Park.	Nora Creek.	Tarana.	Orange.
					For Fallow Period.					
	June-May.	Aug.-May.	Oct.-May.	Aug.-May.	Aug.-May.	Jan.-June.	Sept.-June.	Sept. May.	Sept.-May.	Oct.-May.
	27·60	23·55	13·31	26·79	26·42	8·83	26·14	21·21	24·80	15·21
					For Growing Period.					
1925.										
May ...	fr. 21st	fr.20th	fr.19th	fr.23rd	...	...	...	fr.12th	...	...
	...	·68	·30	...	...	...	...	2·10	1·22	2·34
June	5·35	4·50	2·05	4·84	5·24	4·62	...	5·08	·91	5·88
July	1·14	1·25	1·55	3·42	4·20	3·04	1·91	2·88	·66	4·14
August	·46	·87	1·72	1·55	1·71	1·10	1·13	1·44	1·69	2·27
September ...	·42	·54	·18	1·29	1·04	1·17	·80	·63	3·25	1·17
October ...	·95	1·41	·29	1·16	2·12	2·37	1·38	2·04	2·59	1·84
November ..	2·59	2·23	2·61	3·90	3·10	3·05	2·59	3·49	6·23	2·61
December ...	...	...	...	·80	1·30	·94	...	...	...	...
Total ...	10·91	11·48	8·70	16·96	18·71	16·29	7·81	17·66	16·55	20·25

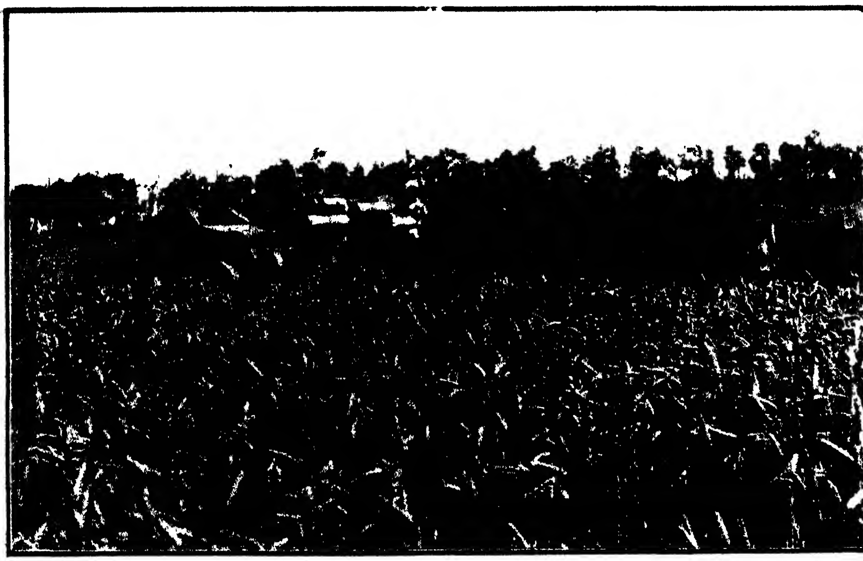
Cultural Details.

"*Kikiamah,*" *Grenfell.*—Wheat and oat variety trials were conducted for grain sown on 19th and 20th May, with 50 to 52 lb. graded copper carbonate-treated seed and 50 lb. superphosphate. The plots were on an old cultivation paddock, and the soil, a light red loam, was mouldboard fallowed July-August;

harrowed twice and tine cultivated in March and just prior to sowing. The soil at sowing time was moist and in excellent condition, and germination was excellent.

The wheat plots were lacking in density, but were even and fairly short in the straw. The oat plots were very dense and exceptionally heavy. The excellent yields of both were due to well-worked clean fallows, the absence of weeds during growth, and a well-distributed rainfall.

Eugowra.—Grain trials of wheat and oat varieties were sown on 19th to 21st May, with 52 lb. seed and 50 lb. superphosphate per acre. The soil, a light red loam, was exceptionally well worked; mouldboard ploughed second week in June, harrowed in August, spring-toothed in October, one-way disced



Harvesting Penny Wheat at Quandong.

mid-January, harrowed mid-February, spring-toothed mid-April, and "combine" sown. Germination and subsequent growth were satisfactory, and the yields obtained were considerably above the district average, and evidence the value of working the fallows well and often.

Quandong, Grenfell.—A light red loam, sloping; first broken in June, 1924. It was disc cultivated early in February, and again in March, and spring-toothed just prior to sowing. Sowing took place on 21st and 22nd May, with 56 lb. graded seed and 50 lb. superphosphate per acre. Take-all developed in the plots, and the degree of attack was estimated to be 20 per cent. in Waratah. Canberra, and Federation, 15 per cent. in Bena, 6 per cent. in Penny and Yandilla King, and 3 per cent. in Wandilla, Gresley, and Hard Federation The yields obtained were, under the circumstances, remarkably good, averaging over 32 bushels per acre.

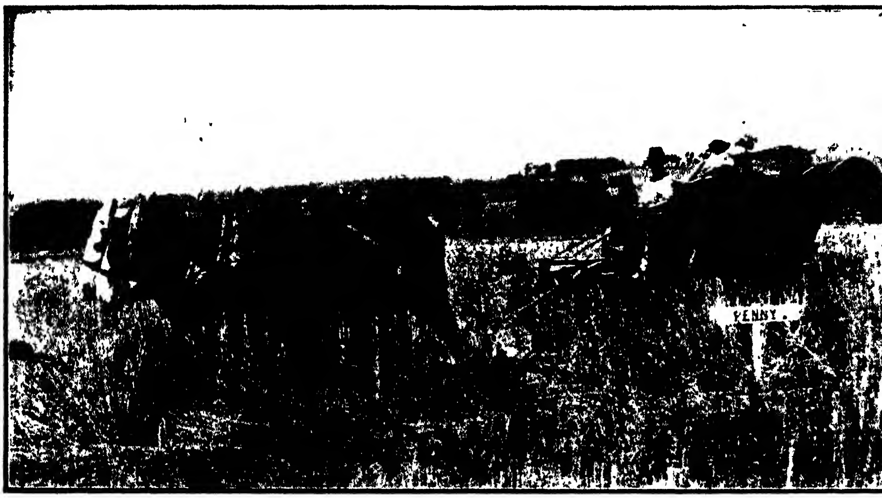
Greenethorpe.—Sown 19th and 20th May with 50 lb. graded seed, and 56 lb. superphosphate on a level, light red loam, typical of the locality. The fallow was mouldboard ploughed in August, and harrowed, disc cultivated in October and February, spring-toothed in April and previous to sowing. The varieties all germinated well, but later growth was not dense. All were short strawed and yielded heavily with an excellent heavy sample of grain.

Tallawang.—Red loam soil, the paddock being under a regular rotation of (1) winter fodders, and (2) wheat, for the last eight years. The fodder crops of oats and barley in 1924 were fed off, and the ground disc-ploughed by the first week in October; spring-toothed on 11th November, and again the same month. After heavy rain had compacted the surface sheep were run continually on the fallow, which was spring-toothed prior to sowing. Sowing took place on 19th and 20th May, with 58 lb. copper carbonate-treated seed, and 56 lb. superphosphate per acre, the soil being in good tilth. Drought conditions have prevailed at this centre for the last four years, and the last season was very bad. On the fallow only 13·31 inches of rain fell· and on the growing crop 8·70 inches, of which 2·6 inches fell in mid-November almost too late to be of benefit. Under the circumstances the yields obtained were exceptionally good, and averaged 18½ bushels per acre. It was the best crop in the district. The average yield in the district was less than two bags to the acre. This has been the experience with these plots for the last four years, and is evidence of the value of the rotation adopted.

Cumnock.—Soil, a light loam, typical of the locality; sown 12th and 13th May with 50 lb. graded and dry-treated seed, and ½ cwt. superphosphat per acre. The ground was mouldboard ploughed 4 inches deep in September, disced in February, spring-toothed in March, harrowed in April, and sown with the combine. The crop was harrowed in August. Germination was satisfactory, but stooling was light owing to heavy winter rains. Straw short, but grain plump and weighed heavily. Bena yielded exceptionally well, but Union, which did considerably better in a larger area on the farm, did not show to advantage. An increase of 9½ bushels to the acre was obtained by the application of 56 lb. superphosphate with Canberra.

Neville (A. Rowlands).—Wheat and oat variety trials were sown, the former on 22nd and 23rd May, the latter on 15th June, with 56 lb. seed and 90 lb. superphosphate per acre. The soil, a red loam, was ploughed for the wheat in August, harrowed before and after harvest, and disced and harrowed in May. The oats were on potato land, the crop being dug in May, after which the ground was ploughed and harrowed for the oat crop. The winter rains were very heavy in this locality, and the frosts very severe. The soil set firmly and the crop was thin throughout and uneven, causing wide variations in yields. The oat plots were sown too late, and yielded well under the circumstances. The district is a late one, harvesting of both wheat and oats not being done until the first and second week of January.

Borenore.—Soil rich red loam, basaltic; deeply ploughed August, spring-toothed November, reploughed April, harrowed in May, and spring-toothed prior to sowing. In June and July 9½ inches rain fell, which compacted the surface. The crop was harrowed in spring, but did not materially loosen the surface. Sowing eventuated on 12th June, with a bushel of graded seed per acre and 60 lb. superphosphate. Harvesting took place in the second week of January. The late rains greatly benefited these plots, and were responsible for the very satisfactory yields obtained.



The Harvester in the Plots at Quandong.

Bowan Park.—A "quantity of superphosphate" trial was conducted on a deep red basaltic loam. It is not customary to use superphosphate in this locality, and the experiment was conducted to determine whether its application would be profitable. Canberra was used; sown on 9th July, with 1¼ bushels bluestoned seed per acre. The fallow was mouldboard ploughed end of August, spring-toothed end of January, one-wayed in April, spring-toothed in May and June. It was in very moist condition at sowing time. Both standard and high-grade superphosphate were used in the trials in varying amounts, the former being superior to the latter and giving increases over unmanured up to nearly 5 bushels per acre.

Carcoar.—A hay trial of wheat varieties was sown in a poor grey loam soil, previously under potatoes; sown 17th June with 90 lb. seed and 60 lb. superphosphate per acre. Soil in good condition at sowing time. Heavy winter rains and cold frosty weather caused the soil to wash and plants to stool badly. The yields of hay were light, Cleveland being the best yielding variety, as in previous years.

Neville (F. Goodacre).—An oat hay trial was sown on 6th June, with 1½ bushels seed and 60 lb. superphosphate on light loamy soil, previously sown with potatoes. Climatic conditions were similar to those of Carcoar, and the yields were not high. Sunrise gave the highest yield and the best quality hay.

Tarana.—A trial was conducted of four oat varieties for hay on fallowed ground, well worked and in good condition when sown on 15th May; 55 lb. seed and 50 lb. superphosphate were sown per acre. Crops lacked density due to seasonal conditions, but were benefited by good November rains, and the yields under the circumstances were satisfactory. Lachlan burnt off somewhat, Sunrise and Algerian producing the best quality hay.

Orange.—A trial of wheat and oat varieties for hay was sown after winter fodders in a definite rotation with wheat. Soil, a light loam, which at sowing time was in a moist condition. Severe winter conditions of temperature and moisture retarded growth, and yields were light. The plots were sown on 5th May with 60 lb. graded seed and 60 lb. superphosphate per acre.

OAT Variety Trials for Grain.

	Grenfell. (C. A. Carter.)	Eugowra.	Neville. (A. Rowlands.)
Date sown	21-5-25	21-5-25	23-5-25
	bus. lb.	bus. lb.	bus. lb.
Fulghum	55 35	...	22 5
Mulga	46 16	36 0	24 19
Algerian	38 7	42 35	27 0
Sunrise	35 26	40 22	...
Lachlan	33 20	42 27	22 7
White Tartarian	...	...	27 23

WHEAT Variety Trials for Grain.

Variety.	Grenfell. (C. Carter)	Eugowra.	Quandong	Greenethorpe.	Cumnock.	Borenore.	Gulgong.	Neville (A. Rowlands)
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Marshall's No. 3 ...	42 18	...	...	33 45	...	30 3	...	16 0
Waratah	37 11	26 50	29 17	34 53	29 3	29 22	...	21 18
Penny	35 16	...	40 44	33 6	...	30 10	20 17	27 5
College Purple Straw..	34 0	27 0	...	...	25 50	29 26	18 2	...
Canberra	33 51	26 56	28 0	29 30	28 38	20 40	21 21	...
Bena	32 42	30 47	32 23	34 50	32 25	32 4	16 17	15 30
Wandilla	32 20	29 35	34 26	31 27	...	22 10	20 43	20 49
Federation	32 8	27 24	27 25	...	28 58	...	...	...
Currawa	27 39	...	...	...	...	...	...	...
Yandilla King ...	...	31 23	33 4	...	26 48	29 16	13 12	16 44
Gresley	...	...	33 15	...	...	18 31	...	17 22
Hard Federation ...	...	...	32 26	...	...	...	...	..
Union	...	...	...	...	23 34	...	...	...
Clarendon	...	...	...	...	23 28	...	...	...
Cleveland	...	...	...	...	...	28 12	...	25 49
Minister	...	...	...	...	...	...	18 5	...
Onas	...	...	...	...	...	...	...	14 50

WHEAT and Oat Hay Trials, 1925.

Variety.	Carcoar.	Tarana.	Orange.	Neville (F. Goodacre)
	Wheat Varieties.			
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Cleveland	1 12 0 0	...	1 2 3 0	...
Cadia	1 2 3 0	...	...	...
Bena	1 0 2 0	...	...	...
Penny	1 0 1 0	...	1 1 2 0	...
Canimbla	0 19 2 0	...	1 0 3 0	...
Onas	0 18 1 0	...	...	...
Gresley	0 17 3 0	..	1 0 2 0	...
Firbank...	0 17 2 0	...	...	...
	Oat Varieties.			
Sunrise	...	1 5 1 0	...	1 10 1 0
Lachlan...	...	1 1 3 0	1 1 2 0	1 5 0 0
Algerian	...	1 4 0 0	1 2 2 0	1 2 2 0
Guyra	...	...	...	1 2 0 0
Mulga	...	1 4 3 0	...	1 1 2 0
Fulghum..	...	...	...	1 0 1 0

MANURIAL Trials with Wheat (Variety, Canberra).

Fertiliser	Bowan Park.	Gulgong.	Cumnock
	bus. lb.	bus lb.	bus. lb.
Superphosphate, 84 lb. per acre	22 14	...	...
,, 56 ,, ,, ...	21 13	21 21	28 38
,, 45 ,, ,, ...	21 7	...	...
High-grade superphosphate, 45 lb. per acre ...	18 47	...	...
,, ,, 35 ,, ,, ...	16 44	...	...
No manure	17 19	20 0	19 0

Summary of Results.

The most consistent variety this season has been Penny. This variety (a selection from Squarehead by a Western Australian farmer) is not a new one, and has always yielded well, particularly in the Grenfell district. The season suited it last year. Bena, Waratah, and Wandilla, of the newer varieties, and Marshall's No. 3 and Canberra of the older ones gave the best results.

Although the season favoured Federation, it did not yield up to expectations. The dry conditions during October caused a number of the less hardy varieties to "burn off." Bena, College Purple Straw, Wandilla, and Yandilla King were commencing to go off, while Waratah and Canberra showed outstanding hardiness. The rapidity with which Waratah has established itself in the chief wheat-growing centres of the central west is remarkable.

The yields from oats at Grenfell and Eugowra were exceptionally good, particularly with Fulghum at the former place. This oat is an importation from the United States of America, where it is largely grown. The grain is of a dun brown colour, is smooth, and of medium length. The value of oats as a rotation with wheat, for the control of diseases and the more economical working of the mixed farm, is becoming more recognised.

Fertiliser experiments have proved the necessity of superphosphates, and the possibility of increased returns from heavier applications.

Murrumbidgee Irrigation Areas.

E. B. FURBY, H.D.A., Agricultural Instructor.

DURING the 1925 season wheat and oat trials were conducted by the Department with the co-operation of the following settlers:—

C. A. Long, Farm 1589, Lake View.
J. McGann, Farm 126, Hanwood.
MacDonald Bros., Farm 197, Hanwood.
J. Fuke, Farm 1622, Yenda.
J. Lyne, Farm 1636, Yenda.
S. H. Kelly, Farm 529, Beelbangera.
F. H. Butler, Farm 1645, Beelbangera.

In arranging the trials it was the object to have them located on the main types of soils found on the area. This practice was followed in the previous year's work, when some crop failures were experienced on one class of land. This has again happened in the case of Farm 1645, where the soil is of a pronounced "crab holey" nature, difficult to efficiently water, subject to flooding during heavy rain, and most difficult to work by ordinary methods, but nevertheless forming a large tract of country devoted to "large area farming." The fact of the experiment being a failure does not necessarily mean that the country is unsuitable for crop-growing, for it is suitable but only under very favourable circumstances, which would preclude it from being cropped as a regular practice.

Departures were made with some trials, which in the main were intended for hay, the change being mainly due to interference with the harvest by rains in the spring and early summer, and partly were due to the desire of settlers to strip their crops in preference to converting them into hay. Crop growing on the "Area" has now resolved itself into one of grain production, hay-growing not giving such quick returns besides being fraught with other difficulties of production which do not permit the local grower to compete profitably with the more cheaply produced crops of the dry area.

For the past several years the seasons in the district have been good, the rainfall occurring with a certain regularity over the same period each year,

with only slight variations. In 1925 the rain season started in May and ended in August, but was followed by early summer rains about harvest time. These late rains did considerable damage to hay crops, and interfered with the harvest. Nevertheless, the season was such that irrigation could easily have been dispensed with altogether, save in regard to the very late crops, and the results of the experiments must not therefore be interpreted as results from irrigation practice entirely.

The rainfall over the growing period was distributed as follows:—May, 422 points; June, 267; July, 92; August, 154; September, 46. Total, 981 points.

The plots being located in various parts of the area, the falls in each centre necessarily varied a little.

The Plots.

Farm 1589.—The plots on this farm were on fairly new land, a crop of oats having been grown in 1923 only. The soil was of a medium heavy red clay, overlying a deep limestone nodular subsoil, and was well drained. It was ploughed in June-August, 1924, disc harrowed once in the spring to kill weeds, disced again in February, 1925; watered early in April, and disc cultivated after watering. Frequent rain delayed planting, which was finally carried out on 8th June, which is a little late for the ordinary varieties grown here, for the early maturing varieties in this trial the sowing proved satisfactory. Germination was very good, and was not affected in any way by the dry pickling of the seed. Owing to the lateness of sowing stooling was not good, though the crop generally was a very good one. Seed at 65 lb. per acre and superphosphate of standard grade at 70 lb. were used. Flag smut was noticeable to only a very small degree.

With the possible exception of Riverina and Barwang, the yields were very much the same, and left little to choose between the varieties. Riverina, which gave the highest yield, does not appear a first-class hay wheat, owing to excessive flag growth, but would be more suitable as a late sowing for grain. It ripens about the same time as Gresley. Wandilla, a variety which is attracting much attention here, did not come up to expectations. It is a good hay variety, and was almost free from flag smut. Barwang will require further trial to demonstrate its possibilities. The remaining varieties are fairly well known on the area.

Farm 126.—On this farm the land is a medium heavy red clay, very flat, and badly drained. It was ploughed on 25th January, disced 5th June, and graded and sown on 10th June, the soil then being in very good condition after a minimum amount of working. No waterings were given prior to sowing, but the crop was irrigated once in the spring. The land had not grown a crop for two years. Much damage was done to this crop by excessive rain just after sowing, consequently germination was poor. Large patches

of crop were killed out entirely. Under the circumstances, the yields obtained were very fair, particularly from Barwang, a new variety, which gave over 2 tons of hay per acre. This variety appeared to be a particularly good one for hay, and also for its apparent yield of grain. It stood up very well to the wet conditions. Gresley, which yielded the heaviest, was not affected to any extent by the flooding. This variety can always be recommended for late planting. Seed at 70 lb. per acre and superphosphate at 100 lb. per acre were used in all plots.

Farm 1622.—The soil here is a red loam of good depth, and easily worked. The hay plots were grown under irrigation and the grain on an adjoining dry area where the soil was similar, perhaps a little lighter, being virgin country. The irrigated land, which grew a crop of wheat for hay the previous year, was disc ploughed in February and harrowed four times after rain, and disced again the first week in April, when Zealand was sown. Marshall's No. 3 and Yandilla King were sown the second week in May.

TRIALS with Wheat for Hay.

Variety.	Farm 126.	Farm 1589.	Farm 197.	Farm 1622.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Firbank...	1 10 0 7	1 13 0 4	....	....
Waratah	1 12 1 7	1 19 2 8	....	....
Clarendon	1 12 1 7	1 16 0 18	....	....
Wandilla	1 13 3 14	1 5 0 20	....	....
Barwang	2 4 2 25	1 1 0 1	....	....
Riverina	1 12 0 6	2 1 0 6	....	....
Gresley ...	2 7 2 4	1 15 0 4	1 6 0 15	....
Zealand ...	....	....	0 13 0 21	2 10 0 0
Penny ...	....	....	1 8 1 12	....
Yandilla King ...	....	....	....	2 0 0 0
Marshall's No. 3	....	....	....	1 18 0 0

TRIALS with Wheat for Grain.

Variety.	Farm 197.	Farm 1622.
	bushells.	bushells.
Bena ...	12	30
Cargo ...	17	15
Gresley	....	18
Yandilla King	14	....
Marshall's No. 3	14	....

Excessive rain caused the loss of portion of the crop, otherwise germination was very good, and the crop grew well. It was not watered in the spring. The yields were good, particularly from Zealand, which further demonstrates the value of this variety if properly used. Marshall's No. 3 and Yandilla King are well known varieties here, and can invariably be relied upon to "deliver the goods."

The dry area was ploughed in July, 1924, harrowed in August, one-way disced in January and again at the end of February to kill the wild melons, harrowed two ways in March, and the seed sown at 58 lb. per acre in the middle of April, together with 60 lb. of superphosphate per acre. All this detail can be considered good practice, as proved in the yields obtained. Bena, Cargo, and Gresley were grown. Bena, which was grown for the first time here, attracted much attention both before and after harvest. It grew to a nice height of 3 feet, and ripened just a little earlier than Federation. Cargo did not do so well being; a later maturing variety, the grain was pinched. Gresley grew very tall, but the grain did not fill as well as expected. Beyond a small amount of flag smut no diseases were found in these plots.

VARIETY Trials with Oats.

Variety.	Farm 1636.	Farm 529.
	t. c. q. lb.	t. c. q. lb.
Lachlan	2 18 2 0	0 10 3 18
Algerian	2 13 2 8	0 15 3 15
Mulga	2 12 0 9	....
Belar	2 6 1 22	0 11 2 23
Fulghum	1 13 0 6	0 9 3 8
Myall	1 9 3 0	....

MANURIAL Trial with Oats.

Manure.	Farm 529
	t. c. q. lb.
No Manure	0 8 3 20
56 lb. Superphosphate per acre	0 15 3 15
112 lb. Superphosphate per acre	1 3 2 1
140 lb. Superphosphate per acre	1 2 3 7

Farm 197.—The soil here is very similar to that of Farm 126, and is also subject to flooding. It was ploughed with the disc in the middle of April, watered in the middle of May, harrowed and disc cultivated. On account of the late watering and the rain, sowing was delayed. The varieties which were cut for hay, namely, Zealand, Penny, and Gresley, were sown on 7th June. Those for grain were sown as follows:—Bena, 4th June; Cargo, 7th June; Marshall's No. 3 and Yandilla King, 17th June. The whole of the plots were harrowed after sowing. All varieties were sown at 60 lb. per acre, with 56 lb. superphosphate per acre. Owing to the crop being under water for a lengthy period, it came up very patchy, large portions being killed right out, whilst the crop generally suffered with consequent reduced yields. Under such adverse conditions as were experienced the results are very fair. Cargo was the outstanding variety, superseding such varieties as Marshall's

No. 3 and Yandilla King, under conditions where the two latter should have been expected to be on top. Unlike Cargo, Bena apparently does not favour such wet conditions. Penny, in the hay trial, appeared to be suitable for both hay and grain, having good length of straw, not over flaggy, and a good long head. Sown earlier in the season, it should give very good results.

Farm 636.—Here the land is similar to that on Farm 1622—perhaps a little heavier. It was ploughed during the latter end of February, watered during the last week of March, and cultivated early in April with the disc cultivator. It was in excellent condition for sowing on 8th May. A crop had been grown two years previously, but failed. Seed at 60 lb. and superphosphate at 70 lb. per acre were used, and the crop was irrigated once in the spring. Rain delayed harvesting here also, and it was found advisable to leave the manurial trial for stripping. Owing to the smallness of the plots and the large machinery employed, accurate results from the stripping were not obtained. There was, however, a general sameness in the yields from all plots, and likewise during the growth of the crop. This was similar to previous trials when the crop was sown early. It would seem that no material benefit is to be gained from heavy applications of superphosphate, and that generally an average of 60 to 70 lb. per acre is quite sufficient to maintain some sort of consistency in yields.

Amongst the varieties, Myall and Fulghum were the only two giving comparatively low yields. The latter variety has been tried here before with similar results. It does, however, make into very nice hay, the straw being very fine. It is a poor stooler. Belar appeared to be a better stripping oat, as the head was large and the grain plump. Myall and Mulga are much alike, and early maturing, and really more suitable for green feed purposes compared with Algerian, which variety for general purposes, and particularly for the wet seasons, would be difficult to supplant.

Farm 529.—From this plot the results are scarcely worth recordin g, being very poor. A piece of heavy red land was used, which was irrigated very late in the autumn, and remained in such a condition that it was not possible to plant till 17th August. A fair strike was obtained, but the crop grew badly, owing largely to the fact that it had to be watered early in the spring. There have been cases where such late-sown crops have turned out particularly well, though as a practice it must be avoided, as success only comes when growing conditions are specially favourable. Algerian was outstanding amongst the varieties, again demonstrating its superiority under very adverse conditions. From the manurial trial it was found that the heavier rates gave correspondingly higher yields.

Summary.

Apart from the interesting comparison of yields, one thing that has to do with the time of planting stands out very plainly. Leaving aside the experiments, it is very apparent when going through the district that the crops

are not what they should be for an irrigation area. Recognising that continuous irrigation may have a deteriorating effect upon the soil, and making due allowance for other influences, the crops in the main are low yielding. On the other hand, excellent crops may be seen on all classes of land, and it is generally found that those good crops are not late sown crops, but were put in at that time of the year when there is less risk of damage from the early winter rains, which starts some time about the end of May or early June. Of course, now and again a late sown crop is "fluked." Such, for instance, is one of Yandilla King sown on 9th August, and yielding approximately 30 cwt. of hay per acre. It is much better, however, to err on the safe side, and to have the seed in the ground in April or May, when the chances are with the crop and not against it.

The preparation is just as important, and if fallowing cannot be practised to any great extent, then the land should be ploughed early, and in readiness for sowing at the right time. Ploughing in May does not give any crop a fair chance.

"Wool Marketing in England and Wales."

The production of wool in Great Britain has been computed at about £6,000,000 for the year 1924, and judged from its total value the product is not of great importance to British farmers. Moreover, home-grown wool is usually only a by-product in the production of mutton and lamb.

The British Ministry of Agriculture, however, having regard to the fact that all efficient industries pay as much attention to the by-products as to the main item, has conducted an investigation into the wool market as it affects their own production, and has now issued a report that is of interest to all wool growers in England and Wales, and that will also be found instructive to many in this State. "At the present time," the report says, "indiscriminate breeding is probably the principal obstacle to the efficient production and marketing of wool" in the countries named.

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An Opportune Start—A Premature Stop.

The great value of even one extra cultivation at a time judiciously chosen is illustrated by the experience of Mr. Moar. Having been stopped by the rain at hay-cutting time, he lightly scarified a strip in a paddock of fallow. After completing a round or two it was decided to abandon the work, as the soil was so hard that the scarifier was only scratching it. In the following autumn wheat was sown over the whole paddock; the resulting crop was light, but the strip stirred by the scarifier in November could be traced to an inch, and on it the crop was much thicker, taller, heavier and later. The check given the stinkwort by the cultivation while it was still very short considerably reduced its vigor, and thus it did not make such big demands on the stored moisture and on the plant food in the soil here as on the rest of the field.—H. A. Mullett, in the Victorian *Journal of Agriculture*.

Is Superphosphate an Advantage?

J. W. WATSON, "Woodbine," Tichborne.*

WHILE great improvements have been effected during recent years in the cultural methods of wheat-growing, attention to the replenishing of the soil with plant-foods is not being neglected, and to this end the use of superphosphate is becoming universal. The areas to which it is applied are being doubled, and heavier applications are evidenced each year.

Fallow is the foundation of good farming, but the proper application of superphosphate on better fallowed land is the keynote of a bigger production. Although superphosphate has been in use for many years in western districts, it is only of late that it has been found to be really a benefit. On certain areas in this district it was probably used as a fertiliser more than twenty years ago, but its importance as a necessary and practical manure in wheat-growing was not generally realised until lately. In many instances farmers have held the view that it is not only no advantage, but that it is waste; and while many of these have become convinced of its beneficial effects in recent years, there are still some who continue to cling to the traditions of their grandfathers.

It is a peculiar thing that for so many years western wheat growers did not appreciate the value of this fertiliser when such wonderful results were being obtained from it in South Australia and Victoria. Probably it was due to the superphosphate not being given a proper trial. In the pioneer stages of wheat-growing farmers were not in the circumstances to experiment, the soil was in a virgin state, and little was known about correct cultivation and the use of fertilisers. Fallow had no place. Thus the essential factor of successful fertilising was missing.

From this state of affairs to present-day methods the development has been gradual. In the first place, the introduction of stock was of enormous value in consolidating the soil. The continuous cultivation altered the nature of the soil, enriching it, and bringing about an "evening up" of plant-foods, together with increased fertility derived from intense stocking. Fallowing favours increased moisture conservation, and sheep have assisted in obtaining compactness of the seed-bed. Without these superphosphate is of little avail. To-day we find that progressive western wheat-growers would not attempt to grow wheat without superphosphate, and they apply it in quantities up to 1 cwt. per acre.

Fallowing and superphosphate go hand in hand. This is of paramount importance in better farming. The old method of scratching up the land any old way and any old time, and applying a little superphosphate or none at all, with the idea that it will grow a decent crop, is obsolete. A

*This paper was read at the Agricultural Bureau Conference at Dubbo on 3rd March.

systematic method is what is required. Manure will not compensate for bad farming. Superphosphate works best on a clean, well-prepared fallow, sound in every detail. Then it is that the individual wheat plant benefits, and after all that is what makes the crop.

The significance of superphosphate is in root development, the soluble phosphates promoting the establishing of a sound root system—a good foundation, which encourages a healthier plant. Earlier maturity is also obtained. Manured plots have been observed to reach maturity weeks earlier than unmanured, and in dry years this must be an advantage. Science tells us that superphosphate exerts its greatest influence in the filling of the ear, also that it economises the water requirements in crop growth.

As it is of such striking benefit to plant development, it follows that it is an enormous advantage to crop production. It is claimed for superphosphate that it produces heavier yielding, sounder grained, cleaner, and more disease-resisting crops, without mentioning the fact that it is good for the land, assisting stubble growth, and leaving a slight residue in the soil.

There is an old worn-out delusion that excess of superphosphate is disastrous to wheat, causing burning off in dry years and rank growth in wet ones; but superphosphate never causes burning off. Crops burn off for want of rain. The facts are that the superphosphate insures good growth while the moisture is there, and then, if there is insufficient soil moisture to carry the crop through, and rain does not come, the crop burns off. The superphosphate does its job, and it is up to us to do ours.

In the same way as the question "Fallow or non-fallow" has become "Fallow and better fallow," so the question "Manure or no manure" has grown to "Manure and more manure." It is here we reach the point whereat we ask how much we should use per acre? There is great divergence of opinion amongst farmers on the point. Everyone will tell you what he reckons is right. And rightly so, too, for every farm should be an experiment station—it doesn't cost much, and what may suit one soil may not suit another. Moreover, to use the same quantity on the same class of land, without giving heed to the way it is worked, is absolutely wrong.

The quantity necessary is influenced by certain factors. Natural conditions, such as rainfall and class of soil, cause quantities to vary considerably. If we consider the quantities applied in the wheat belt of Victoria and New South Wales from south to north, we find the quantities become lighter as we proceed north, until in the north-west 40 lb. is considered ample.

In old-established districts, farmers seem to think that the soil needs more superphosphate, and being in a position to use it they do so, while in the newer settled areas of the north, because the general belief is that the soil does not need manure, its use has not become established. Owing to the soil retaining its original characteristics—looseness and lack of consolidation—the manure may not be receiving justice, because of the

absence of properly prepared seed-beds. A fallow influences the quantity more than one would think. The better the fallow is, the more response there is from heavier applications. But the addition of a few pounds of superphosphate cannot overcome a defect in the fallow.

If we follow out the proper requirements of a fallow, ensuring as much consolidation as possible, provided the mulch is on top there is no doubt about getting better results from more liberal applications of superphosphate. The quantity applied is often increased as the sowing proceeds, and advantage is certainly gained when late sowing is supplemented with a few extra pounds. For the eradication of pests, such as black oats, increased application will give the wheat a quicker start and force the plant forward at the expense of the other growths.

Thus the standard minimum quantity is dependent on the district, rainfall, and working of the fallow, and time of sowing.

Last year, in the crop competitions conducted by the Parkes, Trundle, Bogan Gate, Forbes, and Peak Hill P., A., and H. Associations, the average amount of superphosphate used was 54 lb. to the acre, and about 50 lb. may be considered a minimum standard for these districts. In the older established districts, such as Parkes, where the rainfall is slightly greater, the figures showed an increase of 14 lb. to the acre above the previous year. From this it appears a maximum standard has not yet been reached. There is a tendency to increase the amount, with a view of finding out what benefit an increased application gives.

In conclusion, there is little doubt that on fallow that has been reasonably well worked, superphosphate is a big advantage, and while the minimum quantity per acre may be fixed at somewhere about the figure stated, much experimenting has yet to be done to indicate what may be the maximum standard, which it is yet impossible to suggest.

Concentration on fallow detail is the first essential. This, with an application of superphosphate, will make good years better, and years of low rainfall will yet show good profits.

What the English Department of Agriculture Costs.

An officially contributed article in the "Year Book of the National Farmers' Union for 1926" shows the total cost of the Ministry of Agriculture for England and Wales to be £3,275,000 (in round figures). Of this sum £1,000,000 is devoted to subsidising the beet sugar industry, £875,000 is spent on the settlement of men (primarily ex-service men) on the land, £340,000 on agricultural education, and £310,000 on agricultural research. In addition, £475,000 is required for the general staff of the Ministry and its expenses, and £275,000 for miscellaneous items, none of which are very large, but all of which are of direct advantage to farmers.

Narara Viticultural Nursery.

A Day among Bench-grafts and Resistant Rootlings.

W. H. BROWN, Editor of Publications.

TUCKED snugly among the hills on the west side of the Narara railway station and only 3 miles from Gosford may be found the Narara Viticultural Nursery, where the Department of Agriculture raises the large quantity of material with which the vine-growers of the State are being assisted in the reconstitution of their vineyards on phylloxera-resistant stocks.

The first appearance of phylloxera in this State thirty or forty years ago, and the disastrous consequences in many vineyards as it spread through the principal grape-growing districts, are now matters of history. The Department's early efforts to meet the situation were beset with difficulties and misfortunes, but the commencement of operations at Narara in August, 1913, has proved (as was then profoundly hoped) the harbinger of better things. Though unable at first to satisfy the demands of vine-growers for nursery material, the Department has slowly forged ahead, and now it may be said that the supply has some reasonable relation to requirements. Last winter 175,000 bench-grafts were planted out in anticipation of the demands of the present season, and in addition 240,000 resistant cuttings were set out in expectation of the demand for rootlings which vintners themselves can work over to the desired varieties in permanent positions in their own vineyards.

For a property of little if anything over 100 acres, which has to afford space for the nursery beds involved in all this, as well as for the permanent vines from which stocks and scions may be obtained, the output is quite appreciable. When its significance to the grape-growing industry is also reckoned up, the station is important indeed.

The conditions on the property have proved quite as favourable to the purpose in hand as was originally hoped, and the superintendent, Mr. H. G. White, has the satisfaction to-day of turning out material that is marked by health and vigour, and that seems to meet the requirements of vignerons. Not only is the percentage of takes in the nursery work very gratifying, but the growth of the subsequent rootlings is excellent—the result largely of the cultural methods adopted. One block, planted on 24th October, showed 2 ft. 6 in. of growth in February of this year, and other blocks were little if anything behind.

The station occupies a fertile little valley, along the floor of which flows a stream that hardly ceased to run during the very dry weather of last summer, while the hills on either side afford a variety of conditions of soil and aspect well suited to the different beds essential to the various operations.

On the flats the soil consists of a very deep alluvial wash from the hill-sides, most of it dark in colour, and containing a fair amount of sand. Though subject to flood, this flat is well drained, sweet, and fertile, and is admirably suited in every way to the raising of vigorous, well-rooted nursery stock. On the hillsides the soil is also of a sandy texture, somewhat lighter in colour, but still of good quality, as the growth on the permanent vines—especially the Montpellier, illustrated on page 439, amply proved when seen at the end of last summer.

The nursery beds are located on the flats, where the deep fertile soil ensures good growth, and where the deep ploughing and general cultivation that have so much to do with the vigour of the nursery stock are possible. The permanent resistant vines that supply the stocks and the European vines that supply the scions for propagation purposes are planted on the hill-sides.

Narara Viticultural Nursery.
Looking south-west across the flat.

As already indicated, the work of the station is twofold. The most essential and valuable, of course, is the production of the bench-grafted vines, to the extensive plantings of which last year reference has already been made.

The Success of the Bench-graft.

The actual operation of bench-grafting is now fairly well understood, as well as the great advantage it offers in the saving of a whole season, compared with other methods of propagation. It consists of working the selected variety of grape vine to an ordinary cutting of the resistant stock by means of the whip-tongue graft, and the method is so simple that with a little practice it can be performed very quickly, inexperienced men soon becoming capable

of making 600 to 800 grafts in a day. The experienced men on the nursery do up to and even over 1,000 per day. Bench-grafting is done in the nursery workshop (not in the field), in the winter and early spring, the grafted cuttings being immediately heeled into the soil to prevent them from drying out. In October or November these bench-grafts are lifted and planted out in the deeply worked nursery beds, the rows being about 3 feet apart, and the plants about 4 inches apart in the rows.

Bench-grafting was at one time chiefly done in the spring—just prior to planting out time—but the demand for this class of nursery stock has been so heavy that it has been found necessary to extend operations over a longer season, and the callusing which goes on after the grafts have been heeled

The Permanent Block of Riparia Gloire de Montpellier
Note the luxuriant growth of this resistant vine.

into the soil makes those worked early not less valuable than those done later. Under the favourable soil and climatic conditions that prevail at Narara, the percentage of takes is very large, 60 per cent. being usual.

When it becomes necessary to lift these young vines for sale to growers in the winter following, it is essential that they come up whole without damage to the root system. As the roots go 10 and 12 inches deep—more at times—no spade work would serve, and the method adopted is to plough them right out in rows, putting the implement 12 and 14 inches down. In this way the grower derives the full advantage of the extensive roots that deep ploughing and regular cultivation have induced. The unvarying demand for large numbers of these grafted rootlings year after year is the best proof of the satisfaction they afford growers.

The Resistant Rootling—The Grower's Alternative.

The other class of material sold by the nursery—cuttings struck from resistant vines—enables growers who are able to do some of their own propagation work to purchase rootlings which they can plant out in their permanent positions in the vineyard in the winter, and then Yema bud them to desired varieties in February or March, or (in the event of the failure of the bud) to field-graft them in the ensuing spring. The actual operation of Yema budding has been described by Mr. H. L. Manuel, viticultural expert, in a departmental leaflet. Suffice it to say now that this budding method has distinct recommendations, and even compared with the bench-graft, which saves a full season, it has certain advantages. The injury to the stock is very slight and the union of stock and scion is usually exceedingly good. The method is not difficult to learn, the operation is quickly performed, and the percentage of takes is very large—much larger, if the work is well done, than in the case of field-grafting. In fact, 95 per cent. of takes is quite common where Yema budding is well done, while of field-grafts 60 to 70 per cent. is as much as can be expected. Yema budding, moreover, lengthens the period over which propagation can be carried out, and if failures occur the rootling can still be field-grafted in the spring without the loss of a season.

The Utility of Resistant Stocks.

In the early days of the reconstruction of vineyards on phylloxera-resistant stocks many varieties of American grapes were used, and by hybridisation the number available was greatly increased. Experiment and experience, however, have narrowed these down to a comparative few that have proved their affinity for different varieties of European grapes under different conditions.

It should not be imagined that resistant vines meet all requirements. As a matter of fact they fail at certain points. Notwithstanding many trials, no American variety or hybrid has yet been found that is an absolutely satisfactory stock for Gordo Blanco. Certain American sorts suit that grape fairly well, it is true, but none is all that could be desired. The need for further work in this and similar directions is not overlooked, and it is hoped that time will produce solution to most if not all these problems.

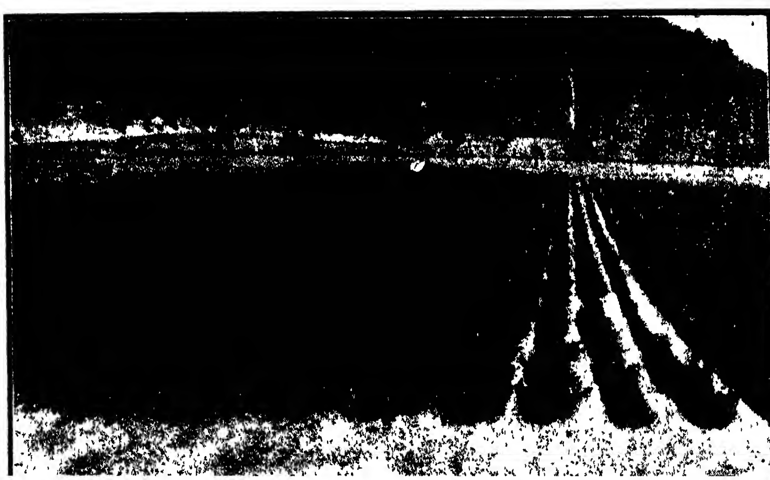
Tests conducted at Howlong Viticultural Station (closed in recent years and transferred to the South Australian Government) showed that in very few cases do European grapes crop less satisfactorily on resistant stocks than on their own roots. Generally speaking, the results have been the other way about, the vigorous root systems of most of the American vines no doubt being an advantage in many cases. One or two grapes that crop poorly on their own root stocks have gone out of use and are never propagated now.

The permanent beds of the European and American vines are grown on 2-wire trellis, the posts being 10 to 12 feet apart. In the earlier plantings the vines were 6 x 12 feet apart, but latterly it has been found that 8 x 10 fee

is more satisfactory. The trellising of the vines affords the maximum convenience for cultivation and spraying, and quite remarkable growth and vigour were to be seen in several of the blocks during the past summer, the heat and absence of rain notwithstanding. In cutting wood from the resistant varieties, the larger cuttings only are used for the bench-grafting, and the smaller for the ungrafted rootlings.

Some of the Resistant Stocks in Use.

Prominent among the stocks grown at this nursery is Riparia Gloire de Montpellier, which is much in demand among growers of table grapes in county Cumberland on account of its success under Black Muscat (otherwise Muscat Hambro) grapes. Last season no less than 90,000 cuttings of this variety were bench-grafted to the Montpellier stock, which makes a big



A Block of Bench-grafted Nursery Stock.

Three months' growth.

root system that demands a good opening method to turn up the roots in proper condition when lifting time comes. The top-growth is of a long trailing habit that fills the eye in the nursery bed, but looking along the rows in the latter part of the summer it was hardly possible to find a failure—so good had been the take.

Riparia x Cordifolia 106^8 has been found useful as taking the place in many districts of Montpellier for table grapes. It proves resistant to dry conditions, producing a vigorous root system. Supplies of wood of this variety were previously drawn from Howlong, but the area devoted to it at Narara is being extended so that supplies may be at hand.

The Riparia x Rupestris hybrids 3306, 3309, and 101[14] are used for both table and wine grapes. They were mentioned by Mr. White particularly in connection with Black Muscat and with such wine varieties as Black Shiraz, and have given consistently satisfactory results.

Aramon Rupestris Ganzin No. 1 is a strong-growing stock that is adapting itself to a variety of soils, and exhibiting an affinity for the majority of wine and table grapes. This variety has the reputation of being better suited to irrigation conditions than almost any other.

Mourvèdre x Rupestris, 1202, gives a high percentage of takes under the Muscats and makes a strong growing vine.

Rupestris du Lot roots freely and is easily worked, and produces one of the most resistant root systems to phylloxera. It shows itself particularly suitable for wine grapes in most soils.

Berlandieri x Riparia 420A is also useful for wine varieties, suiting certain soils well.

The vigour and attractiveness of all the rootlings—bench-grafted and ungrafted—was a pleasure to see during the past summer. Notwithstanding that the season was so excessively hot and very dry, the nursery beds were a picture—testimony to the entire suitability of the site for the purpose and to the thoroughness of the cultivation and careful attention given every block. On the hills the permanent vines had thrown out canes many feet long—proof that they were not less suited by the lighter soils on which they were growing.

Disease Control.

Downy mildew and black spot (or anthracnose) demand both precautionary and control measures. Just after they show a few inches of growth in the early spring the vines in the nursery beds are sprayed with Bordeaux mixture, 6–4–50, as a preventive of downy mildew. In wet seasons it is sometimes necessary to spray at least every fortnight, but in dry seasons, such as that just past, it is found unnecessary to give more than one or two precautionary applications of Bordeaux early in the season. Only in one year in the last six has the superintendent found it necessary to spray the permanent vines for "downy" more than once, and then only Mourvèdre x Rupestris 1202 and A.R. G. 1 required attention, all the others being clean.

The permanent vines are swabbed with sulphuric acid in the winter for the prevention of black spot, but the later sprayings with Bordeaux recommended by the Department are usually only found necessary in the case of one or two varieties, notably Riparia x Cordifolia 106[8] and Riparia x Rupestris 3309, all other stocks being clean.

Other Trials.

The Department has always on hand such a multitude of trials of various kinds that the placing of some of them among the experiment farms and

stations is a matter of difficulty. Being favourably situated in several regards and withal so accessible, several experiments are located at Narara.

A new stock for prunes, the Florida native plum, is being tried for several varieties, notably Robe de Sergeant and Prune d'Agen. It is too early to express a judgment on the result, but the present growth from the working is encouraging.

Several varieties of Pecan nuts—a nut that has attracted some attention in the United States and of which a few specimens have been imported—are being tried here. The trees appear to be growing satisfactorily, but so far they have not fruited, being somewhat slow in coming to profit. The nut rather resembles the walnut in internal structure.

A Block of Bench-grafts and Rootlings.

These have been lifted from the nursery beds and heeled into the soil near the workshop, in readiness for packing and despatch.

A small citrus block, the subject chiefly of certain biological experiments, is showing a nice growth from a good take of buds. Some other trials with passion fruit, French walnuts, Avocado pears, sweet potatoes, &c., may be added to the list.

During last season a 4-acre block of Leaming maize was a prominent feature of the nursery landscape, the good soil conditions, deep ploughing, and frequent cultivation having produced a particularly fine growth that seemed at one stage to promise a heavy yield. Unfortunately the heat and drought reduced the return to quite ordinary proportions.

Abnormalities in the Setting of Fruit.

R. J. NOBLE, Ph.D., M.Sc., B.Sc. (Agr.), Principal Assistant Biologist.

When the blossoming of fruit trees is completed, some of the tiny fruit will be noticed to commence to swell or grow immediately, whereas others do not appreciably increase in size and eventually drop. Later a drop occurs among some of the fruit which remained and grew at first. These drops are often spoken of as natural or normal shedding by gruit-growers, and in a great many cases if they did not occur the trees would carry crops which were far too heavy. But instances also occur in which trees blossom profusely enough, but through one or other (or perhaps both) of these sheddings being excessive there is a very light crop, or possibly none at all. When this happens frequently in certain trees it is time to seek the cause.

Several factors appear to be concerned in the successful setting of fruit, and the following notes should prove of interest in this connection.

Although some varieties produce abundant pollen, they may be self-sterile or partially so. When other varieties are available for cross-pollination the setting qualities are frequently improved and large crops may be obtained. Not all varieties are equally suitable in this connection, for occasionally even though fertilisation may be effected, subsequent undesirable changes may occur in the very young seed and the fruit will fall.

Lack of nitrogen may result in the non-setting of fruit. A sufficient supply of nitrogen may be present in the soil, but as a result of drought there may be insufficient water to insure normal development of the already differentiated stamens and pistils. On the other hand, there may be in heavy seeding a struggle for nitrogen, in which only those blossoms earliest to attain most vigorous vegetative development receive a normal supply of nutriment.

Aside from nitrogen-hunger sterility, the non-development and shedding of fruit may often be due to lack of moisture alone. The setting of fruit may sometimes fail when unfavourable weather conditions prevent the flying of insects concerned in cross-pollination. Fluctuating weather conditions may have a directly injurious affect on the blossoms. The stigma of the flower may not have reached the receptive state or may even have gone beyond it when the pollen reaches it. When the pollen grain has germinated and the germ tube has entered the style (female organ) it may receive a check in growth which results in faulty or total lack of fertilisation.

To summarise, failure to set may be due to any of the following causes:—

1. Self-sterility or partial self-sterility.
2. Absence of suitable varieties for cross-pollination.
3. Nitrogen-hunger sterility.
4. Drought.
5. Unfavourable weather conditions—excessive rains, frost, &c.
6. Absence of insects necessary for cross-pollination.

The Farm Separator.

A. B. SHELTON, Assistant Dairy Instructor.

THE introduction of the centrifugal bowl separator into New South Wales in the year 1883, by Thomas Sutcliffe Mort and David Lyndsay Dymock for use in the first butter factories on the South Coast, and the later adoption of the machine as a unit of the dairy farm, made possible the wonderful expansion of the dairy industry that has since taken place in this country. To-day there are many styles of separators, but all make use of centrifugal force exerted within the separator bowl to separate the lighter from the heavier portions of the milk.

It is not realised by many dairymen that for a separator to do its work efficiently, the bowl must spin evenly at the designed speed, without any vibration or rocking. Separation is affected by :—

1. The condition, stability, and level setting of the machine frame and its parts.
2. The speed of bowl.
3. Inflow of milk.
4. Temperature of milk.
5. Physical condition of milk.
6. Richness of milk.
7. Flushing of bowl when finishing separating.
8. Adjustment of cream screw.

All these governing factors, with the exception of No. 6, are under the control of the operator, and the "richness of milk" can also be allowed for when adjusting the cream screw. Thus it is evident that it is quite possible for dairymen to separate at any desired fat content, within reasonable limits. It is repeatedly found while investigating causes of second-grade cream that many dairymen (while paying full attention to these details) fail to maintain their separators in good running order, thus undoing all their work by leaving the way open for faulty separation. They are actually robbing themselves by spoiling the quality of the cream, and they are also losing fat in the skim milk, where it has not nearly the same value.

In these cases the dairy instructor generally finds that the separator bowl is not spinning evenly, but rocking through vibration. This is easily detected by removing the milk and cream spouts, and watching the bowl while gradually turning the handle up to the designed speed. If side play or vibration be evident, it invariably suggests that one or more of the following faults are present :—

1. The frame of separator may not be fastened down firmly, or may be set out of level.

2. The spindle bearings may be worn, or the top bush may be loose in its position.
3. The pin which holds the bowl spindle in position on the driving spindle (in many separators) may have been bent or damaged by the bowl being dropped on to the spindle when the separator is being assembled.
4. The bowl itself may be out of balance, its centre of gravity having been altered by changing discs or wear.

The first three faults suggest their own remedy, but an unbalanced bowl can only be remedied by returning the bowl to the makers or agents to be adjusted or rebalanced. Most separator agents will provide a loan bowl for use while bowls are being rebalanced.

Of other troubles with the separator, the most frequent is the gradual wearing down of the cleats which space the discs apart, causing the discs to sit so close together that very little milk can find its way between. This can only be satisfactorily remedied by purchasing a new set of discs, or replacing those which are worn, and when that is done the bowl will probably require balancing also.

Any of the faults in the separator outlined above prevent the separator from doing its work efficiently, resulting in too much milk serum being thrown out of the cream spout, and in summer months the excessive milk serum sours quickly and becomes coagulated, and in that condition the cream is distinctly second grade.

In conclusion, it is pointed out that the regulations under the Dairy Industry Act stipulate that "all cream delivered at factories during months of September, October, November, December, January, February, and March for manufacture of butter shall contain not less than 37 per cent. of butter-fat, and during the other months of the year shall contain not less than 30 per cent. of butter-fat."

It will be asked, why should such a regulation be imposed? The answer is simply that it is difficult to keep cream of a lower fat content in a choice quality under ordinary farm conditions.

Infectious Diseases Reported in April.

The following outbreaks of the more important infectious diseases were reported during the month of April, 1926.

Anthrax	Nil.
Pleuro-pneumonia contagiosa	1
Piroplasmosis (tick fever)	Nil.
Swine Fever	Nil.
Blackleg	Nil.

—Max Henry, Chief Veterinary Surgeon.

Strawberry Growing on the Lane Cove River.

LUKE GALLARD, Orchard Inspector.

NOT everyone residing in Sydney appreciates how areas of land of limited acreage situated close to the city can be turned to good account, and made to produce lucrative crops of strawberries.

The areas along Lane Cove, between Lindfield and Gordon and Ryde and Eastwood, have always been noted for the production of phenomenal crops of this luscious fruit, and although the past season has been an exceptionally dry one, some of the growers have not failed to keep up their reputation. Two areas may be mentioned in particular as most attractive in spite of the adverse conditions that have obtained.

The first, which is situated on Waterloo-road, North Ryde, is owned by Mr. Thomas Tumbridge, an old grower of over forty years standing, who has seen the rise and fall of different standard varieties, and has made himself thoroughly conversant with all the vantage points of the calling.

For over twenty years Mr. Tumbridge stuck closely to Creswell's Seedling, a variety that has put up a record for durability which perhaps has surpassed that of any previous variety. This, coupled with the fact that it produces two good crops in the year, greatly popularised it from a commercial point of view, but, as was the case with other old standard varieties, such as Marguerite, Trollop's Victoria, and the old Hautboy or White Strawberry, it is feared the old friend is now losing ground. For several years in different parts of the district it has shown marked signs of distress from a trouble which has puzzled biologists, and which is considered by many of the leading growers as "a petering out," caused probably by the plants being grown in the same locality for so many successive years. Whereas in years past a bed of Creswell's Seedling (from the time it started to blossom till the end of the season) was always a scene of sure and active production, during the last few years in some places the leaves wilted, the young fruit dried up, and, although the root service remained fairly good and no sign of fungi could be detected, the plants presented a very sickly appearance and were unprofitable.

This was one of the factors which caused Mr. Tumbridge, as well as others, to seek a new variety to take its place. One such, known as Port Macquarie, is of very early ripening habit. The fruit is large, conical, with rounded point, and even surface. The colour is a dark bright red, and the flavour is very rich. It resembles the Ettersburg 89 in shape, but is larger and brighter in colour. The plant is a vigorous grower, and carries a heavy foliage. So far,

it has produced some very fine first crops, but the second crops have not come up to the standard of the Creswells. The fruit ripens about three weeks earlier than the last mentioned variety, and consequently commands a higher price.

Fig. 1.—A good bed of the new variety, Port Macquarie.
The bed is the property of Mr. T. Tumbridge, North Ryde.

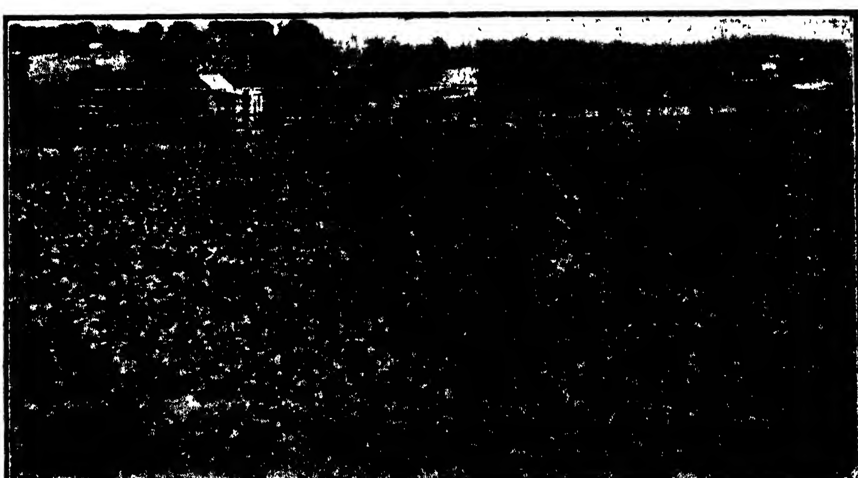


Fig. 2.—Overhead Irrigation is practised on this Farm.

Fig. 1 shows a plot of 1½ acres, taken from the roof of the kitchen looking towards Waterloo-road. The whole bed is shown, the photograph having been taken at long range to show the extent of the area. Fig. 3 was taken at shorter range to give more detail.

These plants were all planted as runners this year, are planted in double rows, and are watered by overhead irrigation. Mr. Tumbridge, with the assistance of his wife and one of their sons, is able to manage this plot, as well as to grow beans and tomatoes, obtaining only a little outside help during the heavy part of the picking season. When the picking season is over, part of the watering plant can be removed and utilised in growing other crops. The soil in this holding is of the heavy, rich black soil type of North Ryde, and specimens of the surrounding timber can be seen in the background of Figs. 1 and 2.

Situated on Balaclava-road, Eastwood, where the timber is of the low stunted type of some of our poor sandstone ridges, the only trees of any size being white gums, a few stringybarks, and a few bloodwoods, is another plot of strawberries about the same in area. The soil is a poor yellow loam, with a clayey subsoil—so poor chemically that until recent years it was considered almost worthless. When ploughed up, this soil is loose and friable

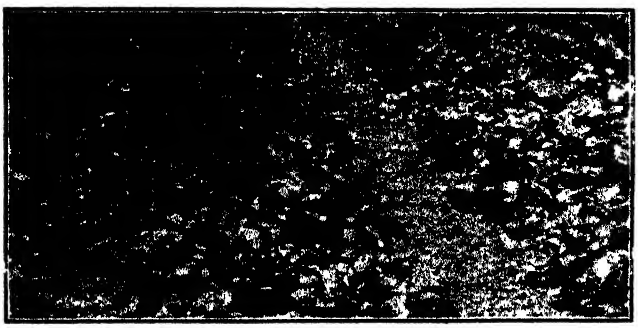


Fig. 3.—A closer view of the bed of Port Macquarie.
A punnet of strawberries can be seen in the front of the illustration.

on the surface. It takes the water well, and produces an abundant root service. The photographs were taken so that the type of land and its timber would be shown in the background, so that the results may be appreciated that have been obtained (even from our poorer soils) under the treatment of a man who understands the business and the soil he has to deal with.

Mr. John Matthews, who is the owner of this plot, is also an old strawberry grower of life-long experience, and on this type of soil he has produced some of the most phenomenal crops that have been raised in the district. The bed shown in Fig. 4 was (at the time when the photograph was taken) one of the finest I have seen. The area shown is about half an acre, and on the day previous five hundred punnets of fine quality berries had been picked from it.

A glimpse of the beans on the left of both pictures will also give the reader an idea of how the grower occupies the slack months, and how the loss occasioned by the ravages of the curl grub among a nice bed of strawberries last year was in part retrieved by this progressive grower.

Fig. 5 shows three rows of the strawberries at close range. These are in their second year, are planted in treble matted rows, and are also watered by overhead irrigation.

Fig 4.—A second year bed at Mr. J. Matthews, Eastwood.
Note the growth of beans on the left.

Fig. 5.—A closer view of the same block.
The beans again show on the left—testimony to the results that can be obtained on soil that the timber in the background suggests must be of low fertility.

Mr. Matthews, although he has tried many other sorts, still claims that none of them can yet take the place of the old champion from a commercial point of view. He says that in this class of soil he can produce with much

less labour larger crops, better fruit, and richer colour, than he could ever produce from the rich black soil areas. With this I quite agree, and attribute the difference chiefly to better root service, which enables the plants the more readily and completely to assimilate the manure and water applied. This soil is certainly much easier to work, and always produces fruit of brighter colour, which is an essential in strawberry growing, as bright appearance seems to count in the market much more than good flavour. Some varieties, which have been tried and have proved to do very well and to be of excellent flavour, failed badly in the market on account of the lightness or heavy darkness of their colour.

The photographs show the nature of the country and the surrounding timber, and also the growth obtained in an extremely dry period like the past summer—the worst experienced for the last twenty years at least.

For the photographs we are indebted to Mr. H. Broadfoot, Senior Fruit Instructor.

Insect Control by Aeroplane.

The dusting of cotton fields with arsenate of lime by the airplane as a boll-weevil remedy, originally developed by the department, has been adopted commercially. Indications are that it will find a place in the regular routine of the large cotton planters. This means that the poisoning will be done by experts in a more satisfactory way than by farm labour The use of the airplane in distributing arsenical dust over more or less inaccessible standing-water near plantations in the delta region of Louisiana resulted in the destruction of over 99 per cent. of the larvae of malarial mosquitoes.—Report of the Secretary of Agriculture, Washington, U.S.A.

Tubercle-free Herds.

The following herds of cattle have been submitted to the tuberculin test by Government Veterinary Officers or approved Veterinary Surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd :—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
Department of Education ..	Hurlstone Park Agricultural High School	......	47	23 Nov., 1926.
Do do ...	Yanco Agricultural High School.	......	29	14 Jan., 1927.
Do do ...	Eastwood Home ..	......	10	7 Oct., 1926.
Do do ...	May Villa Homes ...	......	6	8 Jan., 1927.
W. Burke	Bellefaire Stud Farm, Appin	Jersey	31	19 March, 1927.
Department of Education ...	Gosford Farm Home	......	32	16 April, 1927.

-Max Henry, Chief Veterinary Surgeon.

Pecan Nuts.

W. J. ALLEN.

DURING a visit paid to America some years ago the writer felt that Pecan nuts would do well in the coastal districts of New South Wales, and subsequently recommended that the Department secure seed and stud trees from the United States. Seed was obtained in January, 1915, and sent to Narara Viticultural Nursery, where plants were raised, and a further supply of Stuart, Pabst, Van Deman, Taylor, Latimer, Bolton and Russell seed was imported from the same country in January, 1916, and raised in the same district. Budding wood was secured and supplied to a local nurseryman, who succeeded in raising Pabst, Success, Stuart, Van Deman and Frotscher. In November, 1918, trees of Schley, Curtis, Halbert, Burket, Major, and Niblack were obtained from the United States, also some Indiana cuttings; the last-mentioned, however, were dead on arrival. In September, 1922, a hundred each of yearling and two-year-old trees were obtained from the Forestry Commission.

Pecan Nut Tree; Variety, Pabst.
This tree was raised at Narara Viticultural Nursery. It showed 4 feet of growth in just under six months from whip-grafting in September.

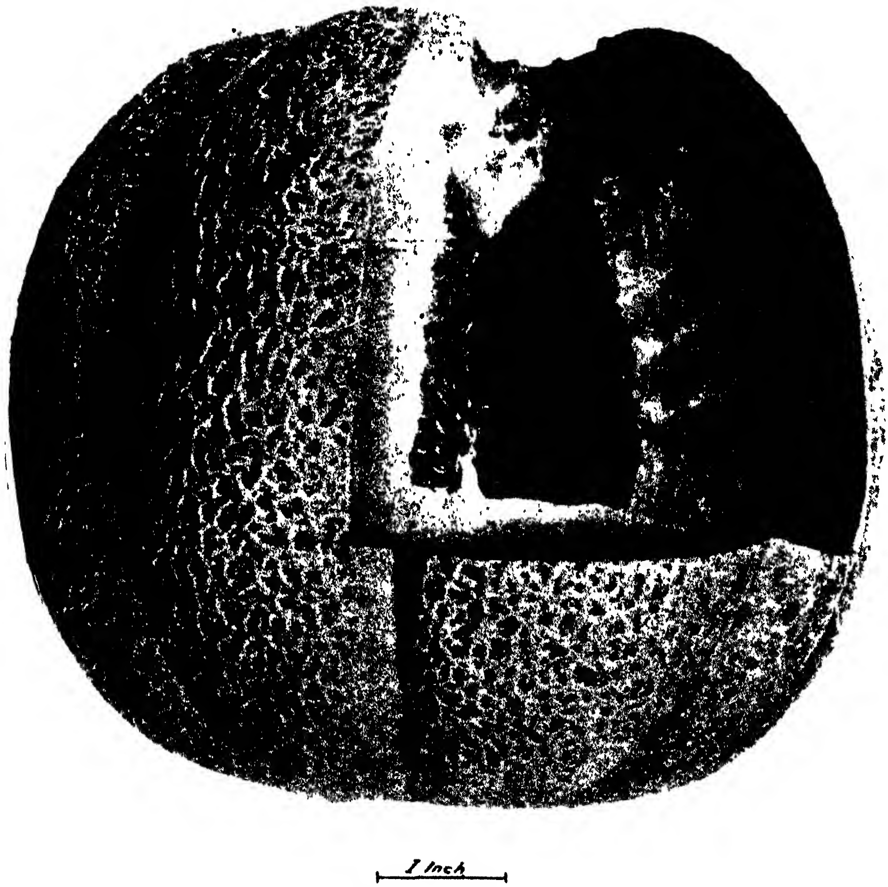
The first worked trees were distributed in 1923, among other places to Hawkesbury Agricultural College and Grafton and Wollongbar Experiment Farms. Only a limited number of buds could be obtained and these were used from time to time for working local seedlings, which latter have proved suitable stocks for our conditions. The worked trees imported have never made the same growth as those worked on seedling stock raised by the Department.

The experiment plot of trees at Narara Viticultural Nursery is situated on a good, deep, loamy soil, where there is a certain amount of moisture: the trees will naturally do much better on good soil in suitable localities where they can be given good cultivation than when planted on clayey hillsides where cultivation is difficult or impossible. At Narara Nursery budding has proved a very successful method of propagating these trees

A Rock Melon Variety Trial

J. DOUGLASS, H.D.A., Agricultural Instructor.

MANY small farmers in the Metropolitan and adjacent areas are beginning to realise that rock melons are one of the quickest, and most profitable crops to cultivate. The public demand for this fruit has greatly increased during the last few years, and the growing has now become a well established side line on many small properties.



Early Hackensack.

With the object of assisting these farmers in some degree, the Department of Agriculture has planned trials and experiments to obtain data in relation to the crop. To ascertain the best types and yielding varieties a variety trial was conducted in conjunction with Mr J. Wilson, of Bonnyrigg, *via*

Liverpool, where the following six well known varieties were planted:—Rocky Ford, Early Nutmeg, Emerald Gem, Paul Rose, Jenny Lind, and Hachensack Early.

The soil is loam, of shale origin, typical of many localities in the metropolitan area. Naturally, the soil is very poor in fertility, lacking organic matter, and of poor physical condition. The physical condition greatly improves with correct cultivation, and the use of green manure crops and of organic manures. The land where this experiment was conducted had been broken up the previous summer and fallowed over the winter. Shallow drills were struck out 6 feet apart, and hills worked up at intervals of 6 feet along the drills. Each hill was dressed with a shovelful of fresh poultry manure, and thoroughly watered about a fortnight before planting time. The fresh manure fermented in the hills, increasing the temperature and greatly improving the water-holding capacity and fertility of the soil. The seed was sown at the rate of six or seven per hill on 18th September, 1925. The germination throughout was excellent and the early growth good. The plants were thinned out to three per hill when the true melon leaves opened out. Cold, unseasonable nights were experienced during October and early November, which checked the growth of the plants. The growing season was very dry throughout, and the hills had to be continually watered by hand. Bees were very active throughout the crop, and an excellent pollination and setting of fruit was obtained. The vine growth was only fair, and the hot weather around Christmas burnt the tender leaves. The pumpkin beetle (*Aulocophora oliverei*) made its appearance, but was checked by dusting with lime and Paris green. Downy mildew was also noticed on the foliage but did not do any great damage. The fruit was a little on the small size, but the flavour and keeping quality was good.

Variety.	Days to Ripening o First Fruit.	Yield per Acre.
		Bushels.
Rocky Ford	118	481
Early Nutmeg	124	173
Emerald Gem	118	365
Paul Rose..	125	269
Jenny Lind	120	77
Early Hachensack	124	327

Notes on the Varieties.

Early Hachensack.—One of the most popular varieties grown, especially suitable for the open market. The fruit is medium to large, round, deep ribbed, and well netted. The flesh is of good depth and light-green in colour, but the flavour and aroma are only fair. This variety can be recommended to growers as it is a good cropper which is eagerly sought after by the majority of buyers.

Rocky Ford or Netted Gem.—Perhaps the most popular and widely-grown variety of rock melon. The fruit is of medium size, slightly oval in shape, finely netted, and somewhat ribbed. The flesh is very thick, green in colour, with a very sweet flavour and aroma. This variety is a particularly good carrier and keeper; the fruit being very uniform in size is easily packed. Rocky Ford produced the heaviest yield, and was the first to ripen fruit in this experiment. These two features are the most desirable qualities aimed at, and make the variety the first to be recommended to growers.

Rocky Ford.

Emerald Gem.—A medium-sized melon, slightly oval in shape, with smooth green skin. The flesh is of medium depth and salmon in colour. The aroma and flavour are particularly good. The smooth skin makes this melon a poor carrier, and not a very popular market variety.

Paul Rose.—A desirable market type, slightly larger than the Rocky Ford. The fruit is slightly oval, heavily netted, and. ribbed. The skin of the immature fruit is light-green, which changes to yellow when fully ripe. The flesh is thick, firm, and orange colour; the flavour and aroma are good.

Early Nutmeg.—A small to medium-sized melon. The flesh is green in colour and has a very fine flavour. The skin is well netted, tough, and the [illegible]it, which is slightly ribbed, carries well. The fruit is fairly uniform in s[illegible] and is a good market type. This variety, although a light yielder, is very popular with both growers and buyers.

Jenny Lind.—A medium-sized, early type, flattened at both ends, heavily netted, and ribbed. The mature fruit is yellow in colour and has a good aroma. The flesh is fairly deep, yellowish-green in colour, and has a particularly sweet flavour. This variety is a particularly good type, but is a light cropper.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st March, 1926:—

Description.	Imports.	Exports.
Interstate.		
	Cases	Cases.
Fresh Fruit ...	665,044	98,431
Tomatoes ...	3,756	...
		Bus.
Melons ...	15	114
	lb.	lb.
Canned Fruit ..	9,100	...
Dried Fruit—		
Unspecified ...	1,400	..
Currants ..	2,520	56
Raisins ..	2,380	56
Apricots ...	476	...
Apples ...	504	...
Prunes ...	196	...
Pears	112	...
Sultanas ...	504	...
Peaches ..	616	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruit—		Cental.	Cental.
Citrus	....	2,686	5,287
Apples ..	....	...	3,578
Pears	....	...	1,027
Pineapples ...	.. ..	...	1,317
Bananas ...	....	708	...
Other	....	214	2,314
Dried Fruit—			
Apples, Pears,		lb.	lb.
Peaches ...	U.S.A.	1,875	...
Apples ...	....	...	616
Apricots ...	....	...	318
Currants ...	....	...	3,952
Prunes ...	U.S.A.	11,464	744
,, ...	United Kingdom	1,480	...
,, ...	France	560	...
Peaches ...	....	...	56
Raisins—			
Sultanas ...	....	...	14,215
Lexias ...	....	..	28
Other ...	United Kingdom	2,400	1,036
	Syria	35	...
	Spain	1,696	...
Dates	Canada	82	...
	United Kingdom	450	83,970
	Mesopotamia ...	39,918	...
	Tunis .., ...	1,875	...
	Asia Minor ...	1,037	...
Other	Arabia	...	1,915
	Asia Minor ...	10,080	...
	China	7,465	...
	Greece	1,580	...
	India	...	...
	Italy	340	...
	Spain	1,068	...
	Turkey	210	...
	United Kingdom	210	...
	United States ...	2,297	...
	Syria	148	...
	France	353	...
Preserved in liquid—			
Apricots ...	....	...	489,223
Peaches ...	....	...	130,575
Pears ...	....	...	6,675
Pineapples ...	....	...	5,935
Raspberry ...	....	...	8,199
Other ...	....	...	26,214

The Peanut.

H. WENHOLZ, B.Sc, (Agr.), Special Agricultural Instructor,
and G. NICHOLSON, H.D.A., Experimentalist, Grafton Experiment Farm.

THE peanut (*Arachis hypogæa* Linn.) is a plant which is stated by authorities to be a native of Brazil, although records show it to have been an important article of food of the African natives in the seventeenth century. It is believed that slave ships carried it from Brazil to Africa and Asia. At any rate, it is now grown as an important food crop in the United States of America, Africa, India, China, and Japan, and many other countries of tropical, subtropical, and even temperate climates.

The United States of America is one of the greatest peanut producing countries at the present time. Although grown there since the early days of settlement, the peanut did not reach commercial importance in that country until about 1870. From that time until about 1900 its importance as a farm crop was relatively small, but the industry has developed rapidly and considerably since then, owing to the enormous increase in the peanut's varied uses, until in recent years the area in that country has reached about 1,750,000 acres.

In addition to its wide variety of uses for human consumption, the crop is utilised largely for "hogging down," or as a feed for pigs. The hay is also of high value for all classes of stock.

Several varieties of peanuts were introduced from America to New South Wales, by the Department of Agriculture in 1912, and these have been tested in various parts of the State, and have been found to be eminently suitable for our climate and soils in certain districts.

The industry has always been retarded in Australia by the ineffective tariff on the nuts, which until recent years could be more cheaply imported from countries such as China, Africa, and Java. With an increase in the tariff, importers have commenced to pay attention to the possibilities of fostering the local product, and with the protection afforded, farmers have begun to attempt the cultivation of the crop on a commercial scale.

Until recent years, also, peanuts were eaten by the Australian people in only one form—roasted in the shell, but it is now estimated that nearly half of the Australian consumption of 1,500 tons annually is in the form of the shelled nut—put up as confectionery, salted, sweetened, in toffees, chocolates, &c. In addition, there is a growing demand for peanut butter, and low grade nuts can be utilised by a local firm for the manufacture of peanut oil and for margarine, for which there is a small local demand and an export trade.

A fair area has been grown in Queensland and in the Northern Territory for commercial purposes, but it is only in the last year that peanuts have

been grown to any extent as a commercial crop in New South Wales, due largely to a recent definite offer by a Sydney firm to buy the local product at certain prices on grade and quality.

The difference between the two main markets for peanuts in Sydney needs to be closely defined, as the variety of peanut and the class of soil used for the purpose need to be determined beforehand by the grower.

For the roasting trade, peanuts of the type of White China must be grown, and light sandy soil must be used. For the confectionery trade (of which the oil trade is a side issue), White Spanish is the best type. For both of these commercial markets high quality is essential, each in its own line. The roasting trade demands clean white thin-shelled, even sized nuts with the "pops" and inferior unfilled nuts graded out, while the confectionery trade demands a high shelling percentage of bright, fresh, well filled kernels, free from weather damage, wrinkling, mould, &c. In the latter case, the nuts are largely bought on grade and the best quality is used for confectionery, while the poor quality nuts are expressed for oil.

Botanical Description.

Monkey nut, earth nut, ground nut, and goober are some of the names commonly applied to the peanut in other parts of the world. In Australia, however, it is universally known as the peanut.

Botanically the peanut is a member of the order Leguminosæ, in which are also included lucerne, clovers, beans, &c. Plants belonging to this order have the power of utilising the free nitrogen of the air. If a plant has been grown under favourable conditions, an examination of the root system will reveal numerous clusters of nodules, which contain countless numbers of bacteria (rhizobia) that live in symbiosis with the plant. It is these micro-organisms that possess the power of collecting free nitrogen from the air and transforming it into an available form for the plant's requirements. For this reason peanuts assist in maintaining the fertility of the soil, but owing to the method necessarily adopted for harvesting the plants, the tops and a proportion of the roots must be removed from the soil; therefore as a renovating crop it cannot be regarded as equal to other leguminous crops which are ploughed in whole as green manure. The peanut differs from other members of the order mainly in that it possesses the peculiar and practically unique habit of forming its seed (nuts) beneath the surface of the ground.

The peanut is a herbaceous annual, its foliage resembling somewhat that of clover. The plants, which rarely exceed 18 to 20 inches in height, may be procumbent or erect in their habit, according to the variety. Stems are thick and angular, spreading and more or less hairy, leaves trifoliate, with small bright-coloured yellow flowers resembling the pea in form, which are borne singly from the base of the leaves. The flowers as a rule have a short lease of life, generally withering the same day as they open. They do not all produce nuts, for some are sterile (male flowers), these being

mainly produced from the upper joints formed by the leaves and stems. After flowering they shrivel quickly and fall away. When fertilisation is complete, the flower stalk carrying the ovary elongates, bends downwards, and penetrates the soil several inches, where the young seedling pod forms and develops into the mature nut. This elongation of the flower stalk or peduncle is commonly referred to as "pegging." If by any chance the flower stalks are unable to penetrate the soil, or are disturbed or brought to the surface, they will wither and fail to mature fruit. The peanut shell or hull, covering the fruit or kernel, corresponds to the pod of the common pea. Its colour is determined principally by the class of country in which the nuts have been grown. The pods contain one to four kernels varying in size and shape, and are covered by a thin skin or testa which varies in colour from a pale brown to a dark red, according to the type. Strictly speaking, the peanut is not a true nut, but a pod containing edible seeds or peas. Probably the term "nut" has been applied owing to the similarity in taste and flavour to a true nut.

Climatic Conditions Favourable to Peanuts.

The principal determining factor governing the growth of peanuts, is the length of the frost-free period. Few other commercial crops grown in temperate zones are so susceptible to frost as peanuts. For the successful production of peanuts the following climatic conditions are essential:—

(1) A frost-free period of six to seven months.
(2) Abundant sunshine.
(3) Moderately high and consistent temperatures. Provided other conditions are equal, the peanut revels in heat and will produce larger returns than in the more temperate zones.
(4) Well distributed though not excessive rainfall.
(5) Comparatively dry autumn conditions so that the crop may mature and be harvested and cured with a minimum of injury to the nuts and vines.

The peanut succumbs very quickly to cold weather, but will stand any amount of heat if the soil is well provided with moisture. The moisture requirements during the first two to three months of growth are very limited, but while the plant will stand a considerable amount of dry weather, payable crops cannot be expected unless a moderate rainfall is assured during the period the nuts are forming and developing. The climatic conditions in which later varieties of maize flourish or where citrus fruits grow to perfection are generally those that are suitable for peanut culture.

Early varieties of peanuts, like White Spanish, will mature in about five months, while varieties such as White China and Virginia Bunch, require from five and a half to six months.

Suitable Districts in New South Wales.

The coastal districts of this State, particularly the North Coast and Central Coast, provide the most ideal climatic conditions, although the limits might

be extended to include portion of the southern coastal districts where late varieties of maize are grown successfully. The tableland districts, although they may comply with the necessary frost-free period, are not likely to prove suitable, for the peanut does not flourish at high altitudes owing to the cool nights materially checking the growth of the plant.

Peanuts have also been grown successfully under irrigation on the lighter loams and sandy soils of the Murrumbidgee Irrigation Areas, but judging from the data at present available there does not appear to be much scope for the development of the industry in the inland districts, except where irrigation can be practised.

Type of Soil Required.

The roasted peanut trade requires, besides other qualifications, a bright clean nut free from dirt and soil stains. For the production of clean, unstained, first quality nuts the best type of soil is a reasonably fertile light or greyish-coloured sandy soil or sandy loam, containing a fair percentage of lime, and with a well drained though moderately retentive subsoil, which will retain a sufficient reserve of moisture for dry periods. Dark-coloured or reddish soils are unsuitable for the production of nuts for the roasting trade, as they invariably contain compounds of iron or other minerals that result in a staining of the shells, thus detracting from their value. Although the staining of the shell is objectionable to the roasting trade, for the confectionery or oil trade the colour of the shell is only of secondary importance. As a general rule heavy soils contain a fair percentage of clay, and apart from other objections to these types, the nuts are more difficult to harvest and do not clean readily owing to the adhesive nature of the soil which clings to the nuts when harvested. Moreover, heavy soils favour the production of excessive top growth at the expense of the formation of nuts, although they will yield well if of a friable nature and well drained. Soils that set, crack, or bake after heavy rains are unsuitable, as under such conditions it is difficult for the pegs to enter the ground. As previously pointed out, it is essential that the flower stalk be able to penetrate beneath the surface of the soil before the nut is formed; therefore a loose friable soil is one of the most desirable conditions in peanut culture. In addition, light friable soils are preferable because of the ease with which the soil may be prepared and with which cultivation and harvesting may be carried out.

Peanuts on light soils may be grazed off by pigs without damaging the texture of the soil, but the same conditions cannot apply to the heavier types of soil.

It will be found that for the production of the largest quantity of marketable nuts, light, fertile, sandy loams, well supplied with humus, will give best results. Peanuts will not thrive on sour, wet, or heavy poorly drained soils; in fact, on such soils it is difficult to obtain a satisfactory germination.

Preparation of the Land.

Like all other cultivated crops, the peanut will readily respond to good cultivation; in fact, good cultivation is one of the essentials to success. On typical peanut land, which is of a light friable nature, the preparation is comparatively easy, and beyond early ploughing and good cultivation no special preparation is required. The initial preparation of the land will be governed to some extent by the previous crop, but if possible it should be fallowed during the winter months so that at least a portion of the winter rains may be conserved. In some quarters, the value of even a short fallow is not fully recognised, for, apart from the fact that the moisture-holding capacity of the soil is increased, there are other important items that should not be overlooked. In districts of a good rainfall these may play an equally important part with the conservation of moisture. When the land is ploughed and allowed to stand for some time, the aeration results in a sweetening and enriching of the soil, due to the decay of organic matter and the action of frosts, rain, wind, &c. This results in the liberation of inert plant-food into an available form in which it is more easily assimilated by the plant. The disposal of all residues and weeds from the previous crop by decomposition is of importance, for it is necessary that the land be free from all such trash when the crop is planted, otherwise cultivation of the growing crop is rendered much more difficult, and the plant does not have the same opportunity of pegging freely.

A deep ploughing should be given during the winter as soon as practicable after the removal of the previous crop, and the land should then be allowed to lie in the rough until heavy rains fall, when it may be harrowed to stop evaporation and kill young weed growth. It is generally advisable to follow up with a shallow cross-ploughing or disc-cultivation from four to six weeks previous to sowing. From thence onwards until planting, every effort should be made to keep the surface soil in a medium fine, mellow, friable condition, to conserve moisture, and to induce the germination of weeds so that they may be killed by further cultivations. In average seasons the free use of the harrows will do all the work that is necessary, although if this does not prove effective the springtooth or disc cultivator may be used to advantage.

Peanuts should not be planted on the same land two years in succession, and to obtain best results one crop every two to three years is sufficient. If possible, the peanut should follow some cleaning crop, such as potatoes, cotton, or a summer fodder crop. When they are preceded by maize, early ploughing is essential so that the maize stalks and other residues may have time to decay before planting. Sweet potatoes are often grown on land suitable to peanuts, but on no account should peanuts follow this crop, for a good deal of trouble will be met with owing to the continuous sprouting of self-sown roots.

The principal points to be aimed at in cultivation are:—

(1) *Early preparation*, so that the moisture may be conserved and the decay of the residues from the previous crop encouraged.

(2) *Freedom from weeds.*—If planting is carried out in a dirty seed-bed, a considerable amount of trouble will be experienced in after-cultivation and chipping, which is expensive, and reduced yields will result.

(3) *Loose, fine, friable surface*, so as to ensure a good germination, without which a profitable crop cannot be obtained, and that the conditions may be favourable for the flower stalks to penetrate the soil easily and thus encourage a rapid development of the nuts.

(*To be continued*).

Soil in Relation to Wheat Varieties.

While rainfall and temperature certainly have most influence in determining what varieties are suitable for a given district, the soil factor must also be taken into account to secure the best yields.

In the Cowra district one farmer who grows Hard Federation had to give up the old Federation, as it was doing no good with him. On the other hand, a neighbour a few miles away has excellent results with Federation, and can get no satisfactory yields from Hard Federation. Californian experience with these two wheats is that Federation succeeds under irrigation, whereas Hard Federation does better with dry-farming methods. This may perhaps be interpreted as a preference for moist, heavy soil on the part of Federation, and for a lighter, loamy soil on the part of Hard Federation.

Major is an instance of a variety which prefers a wet clay to a loamy, free-working soil, whereas on the latter Yandilla King gives better results. Some varieties are very accommodating in their preferences, and Yandilla King appears to be one of these.

It is questionable, too, whether rainfall is altogether responsible for the differences in the varieties that succeed respectively at Condobolin and Trangie. Deeper ploughing is practised at Condobolin, while the Trangie soils pulverise more quickly, seeming to require shallower working. It is possible to store more of the rain in the subsoil at Condobolin, and consequently the Riverina varieties give better results than the earlier maturing sorts which are favoured at Trangie.

We sometimes have inquiries as to the best variety to grow on black alluvial flats. Comparatively late sowing with the right variety would meet the question. In such a case Canberra would suit one district, while Clarendon would do best in another, the soils being apparently quite similar. In this instance climatic conditions seem to be the deciding factor.

A soil survey would be an expensive undertaking, but with the existing system of farmers' experiment plots a great deal of most useful information on soils has already been accumulated, not from the point of view of chemical analysis, which is perhaps more scientific, but from the actual performances of varieties.

Occasionally we hear of a progressive farmer in dry country who fallows carefully being successful with a relatively long-season wheat such as is usually recommended for a cooler district.

As a general rule we should consider it good practice to sow moist, heavy soils early with a long-season variety, and to sow sandy, well-drained soils late with a quick-growing sort.—J. T. Pridham, Plant Breeder.

Manurial Experiments with Citrus Trees.

W. LE GAY BRERETON, Assistant Fruit Expert, and W. B. STOKES, Orchard Inspector.

THE objects of these experiments, as stated in the first progress report (see *Agricultural Gazette,* July, 1925, p. 513) were to determine (1) whether potash is beneficial to citrus trees on a typical citrus soil, and, if so, whether the muriate or the sulphate is to be preferred; and (2) the relative values of (*a*) superphosphate and bonedust as sources of phosphoric acid and (*b*) sulphate of ammonia and nitrate of soda as sources of nitrogen. The experiments (with Valencia Late orange trees) were commenced at Mr. W. Halcombe's orchard, at Narara, in 1922.

The Potash Experiments.

The series was to consist of 135 trees in nine rows, giving fifteen trees to the row, divided into three plots, each comprising three rows, or forty-five trees to each plot. As the centre row of Plot A contained actually only fourteen orange trees and one lemon tree, the yields in Plots B and C were also reduced to fourteen. Results are taken from the centre row of each plot only, the rows on each side receiving the same manure mixture as the centre row and serving as buffer rows to the adjoining plots receiving a different mixture. The soil is of a sandy character, overlying a friable clay subsoil, and is typical of the good hillside orchard soil of the Gosford district. The bed is situated on a gentle slope in one direction only. The rows run up and down the slope, so that all plots have an equal proportion of trees on the upper and lower portion of the slope.

The trees were about nine years old and well up to average development at the time of starting the experiment (August, 1922). The following applications of manure were made per tree:—

Plot A	3 lb. bonedust.
	3 lb. superphosphate.
	2 lb. muriate of potash.
Plot B (Control) ...	3 lb. bonedust.
	3 lb. superphosphate.
Plot C	3 lb. bonedust.
	3 lb. superphosphate.
	2 lb. sulphate of potash.

The manures were applied in August, 1922; March, 1923; September, 1923; April, 1924; and August, 1924. The first results were taken in October, 1923, by picking the fruit from the centre row of each plot; the fruits were machine-sized, and the count of each size from each plot taken from the packed cases. The results of the 1923 season were of a negative character, and did not warrant any conclusion. For the results of the 1924 season the reader is referred to the *Gazette* of the date mentioned.

YIELDS of Oranges in Different Counts per case.

	96.		125.		138.		150.		163.		175.		188.		200.		234.		252.		270.		Under 2¼ in.	Total Fruit.	Total Cases.
	Fruit.	Cases.	Fruit.	Cases.	Fruit.	Cases.	Fruit.	Cases.	Fruit.	Cases.	Fruit.	Cases.	Fruit.	Cases.	Fruit.	Cases.	Fruit.	Cases.	Fruit.	Cases.	Fruit.	Cases.			
Plot A.—																									
Fine-skinned oranges ...	...	...	13	·1	311	2·25	244	1·63	663	4·07	761	4·34	1,326	7·05	824	4·12	220	·94	531	2·11	42	·16	60	4,995	26·77
Coarse-skinned oranges...	...	...	12	·1	64	·47	150	1·0	163	1·0	6	·03	194	1·03	120	·6	...	..	18	·07	16	·05	5	748	4·35
Plot B.—																									
Fine-skinned oranges ...	...	...	5	·04	138	1·0	150	1·0	194	1·19	533	3·05	724	3·85	720	3·6	107	·46	530	2·1	294	1·09	118	3,513	17·38
Coarse-skinned oranges...	3	·03	18	·14	89	·64	...	...	130	·8	4	·02	192	1·02	...	...	83	·35	9	·04	12	·04	6	546	3·08
Plot C.—																									
Fine-skinned oranges ...	...	...	8	·06	158	1·09	300	2·0	654	4·01	550	3·14	2,083	11·08	829	4·15	936	4·0	417	1·65	67	·25	123	6,125	31·43
Coarse-skinned oranges...	5	·05	21	·17	201	1·46	300	2·0	169	1·04	90	·51	383	2·04	85	·43	156	·67	3	·02	10	·04	8	1,431	8·43

THE Yields Analysed.

	No. Packed.		Average to case.	Under 2¼ in.		Percentage 2¼ inches and over.			Under 2¼ in.		Total No. of oranges packed.	Average per case.	Cases per tree.	Total oranges per tree.	Total crop by count.	Total cases packed.
	Fruit.	Cases.		No.	Percentage of total oranges of plot.	By count.	By volume (packed cases).	By weight	Total.	Percentage of total oranges.						
Plot A (14 trees)—																
Fine-skinned oranges ...	4,995	26·77	184·35	60	1·04	86·98	86·02	86·0	65	1·13	5,678	182·46	2·22	382·86	5,743	31·12
Coarse-skinned oranges..	743	4·35	170·08	5	·09	13·02	13·98	14·0								
Plot B (15 trees)—																
Fine-skinned oranges ...	3,395	17·38	195·34	118	2·91	86·55	84·95	84·0	124	3·06	3,935	192·33	1·36	270·6	3788·4*	19·1*
Coarse-skinned oranges.	540	3·08	178·57	6	·15	13·45	15·05	16·0								
Plot C (15 trees)—																
Fine-skinned oranges ...	6,002	31·43	190·1	123	1·63	81·06	78·85	79·0	131	1·73	7,425	186·28	2·66	503·73	7,052·22*	37·24*
Coarse-skinned oranges.	1,423	8·43	168·8	8	·1	18·94	21·15	21·0								

* Reduced to the basis of fourteen trees.

Further applications of manure were made on the plots on 13th February and 28th August, 1925. At the second application (28th August), owing to muriate of potash being unprocurable, five trees in plot A received sulphate of potash instead of muriate; the date of application was so close to picking time, however, that it is most unlikely that the crop was appreciably influenced. At this application all the trees in the three plots received 2 lb. sulphate of ammonia in addition to the dressings detailed above, which latter are rather low in nitrogen. The plots were picked, graded, sized and packed on 19th to 21st October.

It was possible this season, having extra assistance, to grade the fruit according to fineness of skin. This grading was carried out by Mr. R. J. Benton, Fruit Instructor. The fruit was divided into two classes—fine and coarse-skinned—blemishes from insects or other causes over which it was assumed the various manures had no influence being ignored. This form of grading is difficult and requires very close concentration. Mr. Benton had no knowledge from which plots the fruit was coming, so that there was no chance of his being unconsciously biassed.

Though the fruit appeared very even before grading, there was a marked difference in the two lots when compared, showing both the necessity for and the accuracy of the work.

The results are shown in the tables on the opposite page.

The Two Seasons' Yields Compared.

It is satisfactory to note that in the main the results are consistent with those of last season, but growers and others interested are again warned that definite conclusions cannot be formed until the experiment has been carried out over a longer period. The following table shows the two seasons' yields, which for the sake of easy comparison are shown in packed Canadian bushel cases (20 by 10 by 11½ inches, internal dimensions), which case (often referred to as the gin case) is largely used for the marketing of citrus fruit:—

Plot.	Yield in 1924.		Yield in 1925.	
	Canadian bus. cases.	Average per tree.	Canadian bus. cases.	Average per tree.
A	25·2	1·8	31·12	2·22
B	17·36	1·24	19·1	1·36
C	19·22	1·37	37·24	2·66

No account is taken in this table of oranges under 2⅛ inches, figures for which are shown in the preceding tables.

Both potash plots, A and C, again gave a higher yield than plot B, the no-potash control. Plot A yielded 7·84 more cases than Plot B in 1924, and twelve more cases in 1925. Plot C yielded 1·86 more cases than Plot B in 1924, and eighteen more cases in 1925. The average of plots A and C exceeded the yield of plot B by 4·85 cases in 1924, and by fifteen cases in 1925. Thus the superiority in yield of the potash plots is greater this season than

last, and is more marked in plot C than in plot A. The relative positions of plots A and C are reversed. In 1924 plot A yielded six more cases than plot C, and in 1925 plot C yielded six more cases than plot A.

The packed standard case is a fairly accurate measure when a sufficient number of cases are involved ; moreover, it is one that fruitgrowers are familiar with, and is likely to convey to them more than mere weight of crop. Weight, however, is undoubtedly the more accurate measure, and is therefore given. The weight includes, of course, all oranges, even those under $2\frac{1}{8}$ inches.

Following are the figures for the three plots in terms of pounds :—

Plot.	Total pounds.	Pounds per tree.
A	1,605	114·6
B	974*	69·6
C	1,958*	139·9

* Reduced to a fourteen-tree basis.

Size of Fruit.

In the 1924 report comparison of the size of the fruit was shown by grouping the various sizes into three sections and comparing the percentage of each. As irregularity occurs in the proportion of fruit in the different sizes, the placing of such lines even one place one way or the other might give an entirely different interpretation of the results, and it is considered that the average number of fruit to the case gives a more reliable indication of the sizes of the fruit in the various plots.

Both potash plots, it will be seen, show larger fruit than the no-potash control plots :—

	Fruit per case.
Plot A	182·46
Plot B	192·33
Plot C	186·28

The above figures take account of oranges $2\frac{1}{8}$ inches and over; those under $2\frac{1}{8}$ inches were not packed. The percentages of small oranges were as follows :—

	Per cent.
Plot A	1·13
Plot B	3·06
Plot C	1·73

Here again both potash plots show a smaller percentage of fruit under $2\frac{1}{8}$ inches than the no-potash plot. As in 1924, the muriate of potash plot (A) shows a superiority in size of fruit to the sulphate of potash plot (C). An indication of size can also be obtained by comparing the total counts with total weights of each plot :—

	Oranges to the pound.
Plot A	3·58
Plot B	3·89
Plot C	3·6

The foregoing takes into account oranges of all sizes, including those under $2\frac{1}{8}$ inches, and it is significant that both potash plots (A and C) give practically the same number of oranges to the pound, and that by weight both show a larger orange than the no-potash plot (B).

Skin Texture.

Before considering the proportion of fine to coarse-skinned fruit in the various plots, it is well to note that the coarse-skinned section in each plot, both with and without potash, contains larger fruit on the average than the fine-skinned section. The information is embodied in the lower table on page 464 (see third column).

Hence, even if the potash plots showed a higher proportion of coarse-skinned fruit, potash could not he held directly responsible for the whole difference, as it has already been shown that both potash plots contain larger fruit on the average than the no-potash plot. It was thought that this might unduly influence the comparison of fine with coarse when indicated by count, and that this would be overcome to some extent if the comparison were shown by volume or weight. It was questionable whether the packed case would in this instance be a sufficiently accurate measure; also whether weight would be quite reliable, as the specific gravity of large and small, coarse and fine oranges may vary; but as can be seen by the following table the difference by count, volume or weight is only slight:—

	By count.	By volume.	By weight.
Plot A.—Percentage fine-skinned oranges	87	86	86
Percentage coarse-skinned oranges	13	14	14
Plot B.—Percentage fine-skinned oranges	87	85	84
Percentage coarse-skinned oranges	13	15	16
Plot C.—Percentage fine-skinned oranges	81	79	79
Percentage coarse-skinned oranges	19	21	21

Plot C (sulphate of potash) shows a slightly lower percentage of fine-skinned oranges than plot A (muriate of potash) and plot B (no potash), but there is no evidence that can be taken as an indication that potash directly influenced the texture of the skin.

The Results in Terms of Pounds, Shillings, and Pence.

The cost of sulphate and muriate of potash is approximately 17s. 6d. per cwt., or 1·87 d. per lb. Assuming freight, cartage and labour absorbs ·13 d. per lb., we arrive at 2d. per lb. as the cost spread on the orchard.

The number of trees under test is fourteen in each plot, and the yearly application of the above forms of potash per tree is 4 lb. Assuming the trees have had the benefit of two and a half years' of application (*i.e.*, 10 lb. per tree), to produce the results obtained in the two years' tally, the added cost of potash has been 1s. 8d. per tree, or 10d. for each year's tally as set out in the foregoing article.

The average yield of fruit per tree per year of the potash plots was 2·01 cases, and that of the no-potash plot 1·3 cases, making a difference of ·71 case per tree per year in favour of potash manuring at a cost of 10d.

If 4s. was netted from each case of fruit marketed, an average of 2s. 10d. more was received from each tree by potash manuring. This has been gained at a cost of 10d., making a net gain of 2s. per tree, or £10 per acre of 100 trees.

The Phosphoric Acid and Nitrogen Experiments.

Owing to exanthema developing extensively through the trees on these plots, reliable results were considered unattainable. Application of the various mixtures is to be continued, and the owner is giving the whole a dressing of farmyard manure. When the trees recover, further records of yields, &c., will be taken.

THE USE OF SELECTED CITRUS BUDS.

THE terms "selected," "pedigreed," and "certified" buds are used frequently and often improperly. Bud selection in the citrus has been defined by Professor A. D. Shamel as "the selection of a parentage, the selection being based upon a system of accurately collected facts—guess work should not be tolerated."

The "hit-and-miss" method of propagation that was carried on for years in California has been replaced by systematic and scientific recording of the individual tree's performance. Buds are taken from trees whose records show them to be outstanding in quality and quantity of production. That such parent trees are inherently stable in their characteristics, and that buds have been selected from such trees, are points of utmost importance to the grower who expects to realise a profit on his investment.—MELVIN L. ANDERSON, in *California Citrograph.*

THE OPPORTUNITIES FOR MIGRATORY BEE FARMING.

A REVIEW of the honey flows during the past season again gives an idea as to what migratory bee-farming offers to the apiarist in this State. The prospects over practically the whole of the North Coast were excellent, and there was room for thousands of colonies of bees worked on a migratory basis. In the majority of inland districts, on the other hand, practically no prospect was offering, yet there was no move to take advantage of the crop showing on the coast.

We find the same thing when the positions are reversed—the coastal bee-farmer makes no move to take advantage of conditions inland. We find, too, that it happens with some regularity that the off season inland is the good one for the coast, and *vice versa.* In Victoria migratory work is practised to a greater extent: apiarists are found removing their bees quite a distance because of better wintering conditions, and the flows of honey are followed up methodically. As remarked by the writer before in these pages, only a commencement is necessary for such a development here. A season's prospects are indicated by the buds on the flora. These are usually evident during winter, which gives ample time for preparation for the bees removal if necessary.—W. A. GOODACRE, Senior Apiary Instructor.

Improvement of Trees by Bud Selection.

ERIC S. WEST, M.Sc. Agri., Research Officer, Commonwealth Citrus Research Station, Griffith.

It is a recognised fact, amongst both scientists and practical orchardists, that it is possible for one branch of a tree to differ in some way from the rest of the tree and from other trees of the same variety. Such a branch is called "sport" or a "bud mutation." It is also well known that if trees are propagated from cuttings and buds or by other vegetative methods from such a branch, the trees produced will resemble it in its changed characters

All plants and animals are made up of cells about one-thousandth to one-hundredth of an inch in diameter, and it is by the increase in size and repeated division of these cells that the individual grows. In any individual, say, for example, an orange tree, the hereditary factors, *i.e.*, those which determine whether the tree will produce Washington navel oranges or Valencia Late oranges, whether the tree will have an erect or spreading growth &c., are carried by the cells which make up the individual.

Bud mutations are due to a change of some kind in the hereditary material of the original cell. Every bud of a tree is produced originally from one cell This cell increases in size and divides, and the two cells produced grow and divide again; this growth and division goes on until the bud is formed. In the same way, as every bud is produced from one original cell, so every branch of the tree originally grew from one bud, and therefore, if the hereditary material in the original cell that produced the bud changed in any way, the branch produced from the bud will be a sport having different characters from the rest of the tree.

It is thus possible, for example, to find one branch of a Washington navel orange producing so-called Thomson navels. It is possible for such a change to occur in one of the cells produced during division of the original cell that produced the bud, and this cell dividing in the usual way transmits this change to all the cells produced from it. Thus we may get a bud which is half a Washington navel and half a Thomson navel, and the branch which grows from this bud will produce some Washington navels and some Thomson navels; this is called a chimera. The flower buds are, of course, also produced from one original cell and may sport in the same way, so that we may get one fruit on a branch differing in its characters from those of all others. Again, a change may be produced in one cell after the bud has begun to form in the case of flower buds as with wood buds, and here a very curious, though well known effect, is produced in the resulting fruit. All citrus growers are familiar with oranges and lemons that have a longitudinal section of the fruit from stem end to apex of a different character from the rest, such sections may differ in colour, may be raised, or may have thick coarse rind, &c. Such chimeras are very common in citrus fruits, and are also found in apples.

The Washington navel orange is particularly susceptible to bud mutation, and the Thomson navel, Buckeye, and Nugget are varieties which have been produced by propagation of such mutations. Although some bud mutations may have some distinctive characteristic that is desirable, the great majority are retrogressions and undesirable, and by cutting budding wood from such off-type branches these undesirable mutations are propagated. It is on this account that in most citrus orchards a very large number of trees which are unprofitable, producing off-type fruit, are found. They should be cut back and reworked with buds selected from trees known to produce good quality fruit.

Bud mutations occur, however, that produce good quality fruit, though the trees are low yielders. Such mutations are not so easily detected as those producing off-type fruit, and can only be found by keeping performance records, but these too are unprofitable and should be reworked with selected buds.

The keeping of individual tree performance records is the only way to detect unprofitable trees in an orchard. It is an operation which annually involves an amount of time that few orchardists would be prepared to expend on the matter. Another method of elimination recently adopted in California, and within the scope of the practical orchardist, consists in estimating the yield of each tree before picking, and recording the results as being poor, fair, or good, or, if desired, the yields may be divided into five classes, *i.e.*, very poor, poor, medium, good, and very good. Care should be taken in making such estimates that due consideration is given to the age of the tree, and the average yield for the season should be kept for at least four years and averaged.

Effect of Environment on Yield and Quality.

Because one orange tree differs in some way from another it does not necessarily follow that this difference is inherent, and that trees propagated from buds of this tree will also differ in the same way, since differences may be due to soil and climate.

There are thus two groups of factors that determine the way in which an individual will grow, viz., environmental and hereditary. Its hereditary make-up will determine whether an orange tree will produce a navel orange or a Valencia, but environment (under which heading may be mentioned the effect of soil, climate, age, presence or absence of disease, &c.), will have considerable effect upon the quality, and thus oranges from the tropics are inferior to those grown in sub-tropical countries, regardless of the variety. Again, old trees generally produce better quality fruit than young trees, and fruit from trees infected with such diseases as collar-rot are often much superior to those produced by healthy trees. Variations due to environment are often termed modifications in contradistinction to inherent characters, and should not be confused with inherent variations. If a tree produces very good fruit, but there is reason to believe that this is due to the fact that

the tree is dying from collar-rot, there would be no advantage in selecting buds from this tree for propagation purposes. Again, because trees are high yielders of good fruit in one district, it does not necessarily follow that progeny trees will be equally as good if planted in another district under different soil and climatic conditions.

It is often difficult to distinguish between inherent variations and modifications due to environment, but individual tree records will throw light on this question.

If, for example, the records obtained as mentioned above, are entered on a squared chart, so that each square represents the position of a tree in the orchard, certain grouping effects may be noticed. The trees in one part of the orchard may all appear as poor yielders, indicating that the soil conditions or some other environmental factor is the cause of the low yields,

Bud Mutation on Washington Navel at Griffith.

The mutation is seen on the right of the tree, while the original type is behind the figure. Note the open spreading growth and fine foliage of the right hand portion of the tree. The mutation blossoms profusely, but the majority of the flowers fall off. This closely fits the description of Shamel's unproductive strain (Shamel, Scott and Pomeroy, U.S.A. Bulletin No. 623).

[*Photo., E.S.W*

and examination may show that the soil in this area is poorer than on the rest of the grove, or (in the case of an irrigated orchard) it may get too much or too little water. Obviously no advantages would be obtained by budding over these trees, as the new trees would still be subject to the faulty soil or other environmental conditions, but an application of fertiliser or treatment that will increase the fertility of the soil may be desirable. Most

environmental factors are connected with the soil, but in some cases local climatic conditions, such as frost pockets or diseases affecting a small area, may operate.

Individual trees, however, occurring promiscuously throughout the orchard as shown by the chart are probably inherently poor yielders, and if, on a field examination, no obvious external cause for the low yield is evident they should be cut back and reworked with buds from better trees.

In this connection, it is well to point out that an orange tree is really the result of the union of two individuals—the stock and the scion—each of which has its own hereditary complex, and the stock may be inherently weak and unable to support a vigorously growing scion; only vigorously growing seedlings should be used as stocks in the nursery.

The distinction between inherent characters and those due to environment are not always obvious at first sight, even on the same tree, *e.g.*, all citrus growers are familiar with very vigorously growing shoots, known as water shoots, which differ very much in appearance from others (the stems being very angular, the leaves large, and thorns strongly developed) and which bear very little fruit. It might be thought that these were bud mutations as they have many characters quite distinct from normal shoots, but these differences are due entirely to the excessive supply of sap, and after a few years the shoots settle down to normal fruiting and growth habits, and buds taken from such shoots and used for propagation purposes will produce quite normal trees.

Source of Budding Woods.

It is important to use good budding wood, both for reworking and for propagation purposes, and the question arises where this budding wood is to be obtained. Trees that are known to be consistently good bearers of good quality fruit should be selected for this purpose, while those that are exceptionally favoured as to treatment or soil conditions, and which are, therefore, probably only superior because of environmental conditions, should be avoided in making the selection. It is advisable to select buds from the same district or trees which have been grown under similar soil and climatic conditions to those in which it is intended to plant the young trees.

Care should not only be taken in selecting a suitable tree, but in the selection of buds on the tree, bud mutations being avoided. With this end in view it is best to take budding wood from behind clusters of fruit which are true to type—a practice which necessitates sacrificing the fruit in question, but which is justified by the object in view. Even when these precautions have been taken it is possible, as many growers have discovered, that the selection is not of the best owing to the impossibility of differentiating between inherent characters and modifications due to environment. The only way to overcome this difficulty is to raise trees side by side propagated from different parent trees, and to observe the fruiting capacities and other

characteristics of the offspring under similar soil and climatic conditions. Work along these lines is at present in progress at the Commonwealth Citrus Research Station at Griffith.

Bud Selection Work at the Commonwealth Citrus Research Station.

In carrying out this work buds were selected from a number of trees on the irrigation area which are known to have produced consistently high yields of good quality fruit. Nursery stocks were budded with these selected buds, and the resultant trees have been planted out in the same grove at the station, the planting being so arranged that each strain* is distributed evenly over the field.

By recording the yield and characters of the fruit when the trees come into bearing, undesirable strains can be detected, and if, for instance, a certain parent tree of one strain was only superior owing to the fact that it was exceptionally favoured by local soil conditions (the tree actually being off-type or an inherently poor yielder) its progeny trees in this test will be found to be poor yielders or off-type. The influence of local soil conditions is ruled out since all strains are distributed over the whole field, and any local soil variation will affect all trees in that locality regardless of the strain, but will not affect all trees of any particular strain.

The work is now being extended to include buds selected from trees in the coastal districts of the State and the River Murray settlements. With so wide a selection it should be possible to determine and select strains true to type, for use in propagation.

* For the sake of convenience the word "strain" is used to denote trees that have all been raised from the same "parent" tree.

Winter School for Farmers, 1926.

Arrangements have been made for the annual Winter School for farmers to be held at the Hawkesbury Agricultural College from 29th June to 23rd July next. The syllabus covers a comprehensive course of lectures and demonstrations on agriculture, horticulture, live-stock, &c., and in addition, practical training is available in useful work connected with farm life, such as saddlery, engineering, blacksmithing, carpentry, &c.

To meet a popular demand, a special school will be held for those who desire to specialise in the subject of poultry-farming. All branches of the industry will be fully dealt with, and moreover, the students will be given an opportunity of studying such subjects in the general course as are likely to be of value to them.

Farmers and youths over 16 years of age who have been engaged in rural work for at least one year will be eligible for admission to the general course, and admission to the poultry course will be granted to persons of either sex over the age named who are engaged in poultry-farming.

Applications for both schools should be forwarded immediately.

The fee for either course, inclusive of board and lodging, will be £5 5s. Prospectus and full information may be obtained on application to the Under-Secretary, Department of Agriculture, Sydney.

Tannic Acid in Honey.

W. A. GOODACRE, Senior Apiary Instructor.*

THE question of improvement in the quality of honey produced has of late been given much prominence, and rightly so. The Department of Agriculture, co-operative societies, and the Apiarists' Association have all been active in this direction, and good results have been obtained.

Our investigation in regard to tannic acid in honey is for the purpose of further improvement of our product. While very little has been said about tannic acid, and it is rarely mentioned in literature, most bee-farmers have had trouble with it in the course of their experience. It is produced by the chemical action of honey in contact with iron, and is in reality plain ink.

Practically all honey house appliances and containers are likely producers of tannic acid, and in our investigations we find the more intense formation where free action of the air is available; for instance, honey leaking from the cap of a container very soon causes chemical action, and the infusion of ink is observed. Even about the caps of the honey containers we find, in the ordinary course of things, some tannic acid formation, the air having in these cases more chance of assisting production. In filling and handling the containers, especially those with the screw caps, it is best to prevent the honey from coming in contact with the cap. The fact of soldering and screwing on the caps does something toward removing some of the tinning, and thus allowing action to commence.

The honey extractor is another likely source of the production of tannic acid, especially those with the old style baskets. Samples taken from the extractor showing dark streaks or dark stain are often referred to the Department for some advice regarding the cause. The old style baskets have folded tin supporting the wire work, and the honey works its way into the folds and provides there quite a factory for the production of tannic acid, which is extracted along with the honey. Even boiling the baskets previous to each extraction does not entirely eliminate the trouble.

The new style baskets are improved in construction and easier to clean, it being possible to remove the screen supports separately. I would advise apiarists having trouble with their extractors in tannic acid production to obtain the new baskets. Many apiarists leave a small quantity of honey in the extractor over winter, and on being drained out this honey is found to be well charged with the acid. A dark (even a black) stain may be seen on the bottom of the machine, showing where the action has interfered with the tinning, giving a chance for further intense production during the extraction season. The question is, would it be best to thoroughly wash out and dry the extractor at the close of the season? I believe so. In any case

* Paper read at the conference of the New South Wales Apiarists' Association held at Cootamundra, April, 1926.

the extractor should be well drained. In the case of honey tanks, they should be washed out and dried thoroughly at the close of the season, or well drained and well covered. Where honey tanks or extractors show the stain due to tannic acid action, prevent further action by painting the inside of the vessel with hot paraffin wax. Second-hand honey containers cannot be recommended. I have known it to take five washings with hot water before all discolouration was removed, and the tins had only been used once.

Here is an instance which may show how serious the question of tannic acid in honey may prove :—A picnic party in selecting a tin to take water with them, washed out thoroughly, as they considered it, a tin which had had honey stored in it. At the picnic the water was to all appearances quite clear for drinking purposes, but the tea made from it was almost pink in colour, showing the presence of tannic acid. How about honey in such containers when it has to be warmed for liquefying purposes ?

A good deal of the discolouration noticed in honey after being warmed up comes from tannic acid, in many cases faulty tinning in containers permitting the chemical action. See, therefore, that all containers are perfectly bright inside; those with rust spots, even though they are small, or discoloured patches should be discarded. It behoves all to work against tannic acid production, for not one of us would care to have ink in our honey.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

***Wheat*:—**	
Canberra...	Chaffey Bros., Nemingha House, Tamworth.
	J. Watson, Merriwagga.
	T. R. Jones, "Birdwood," Forbes.
Federation	T. R. Jones, "Birdwood," Forbes.
	G. L. McLaren, "Locksley," Nora Ck, Cumnock.
Union	G. L. McLaren, Nora Creek, Cumnock.
***Oats*:—**	
Algerian	C. Bennett, Forbes-road, Cowra.
	J Lyne, Farm 1636, Yenda.
Mulga	C. Bennett, Forbes-road, Cowra.
Reid	J. A. Reynolds, Ben Lomond.
***Potatoes*:—**	
Factor	K. Bowen, "Belleview," Springside.
Early Manhattan	K. Bowen, "Belleview," Springside.
***Broom Millet*:—**	
White Italian	W. Lye, Loomberah.

A number of crops were inspected and passed, but samples of the seed harvested hav not been received, and these crops have not been listed.

Bacillary White Diarrhoea of Chicks.

H. R. CARNE, B.V.Sc., Veterinary Research Station, Glenfield.

BACILLARY white diarrhoea has been found in other countries, notably America and England, to be responsible for very serious losses in newly hatched chicks. The disease is highly infectious among young chicks and the mortality is usually high, reaching 90 per cent. in some outbreaks.

The condition was first recorded as occurring in Australia in 1921, and during 1924 three outbreaks were brought under the notice of this station.

The following are the commonly observed characteristics of the disease. Only recent hatched chicks become affected, being usually under a week old. Chicks may appear quite healthy when first hatched, but after some days some suddenly show signs of being off colour, become drowsy, wings droop, and the excreta appears like white jelly. There is often pasting-up of the vent. Death follows in affected chicks a day or two after the first appearance of symptoms. The droppings of the affected chicks contain large numbers of the causal organism, so that many healthy chicks in the same run rapidly become infected by taking up contaminated food, &c., off the floor.

Investigations on this disease have shown that not all chicks which become affected die of the disease, but some may recover and develop to maturity. These recovered birds in the adult stage appear perfectly normal. It has been found, however, that in some of these birds, both cocks and hens, the organism which caused the white diarrhoea from which they suffered as chicks, persists within the body after the bird has apparently quite recovered.

In the chick the causal organism is usually found in the blood stream and the various organs, as well as in the alimentary tract, but in these apparently recovered adult birds the organism is usually restricted to the genital organs, *i.e.*, the ovaries of the hen and testes of the cock birds. Occasionally, however, other organs in addition are also infected.

In the case of a hen which is harbouring the organism in its ovaries, eggs are laid and included in some of these are organisms with which the ovary is infected. Should such eggs be incubated, the chick on hatching suffers from bacillary white diarrhoea, and spreads it to healthy chicks in the same hatch. The determination whether adult birds are "carriers" thus becomes a matter of great importance, as one such bird in the breeding pens may be sufficient to set up white diarrhoea in the chicks. Not only are carriers dangerous in the breeding pens, but the causal organism is voided with their faeces, and thus whole runs become infected. Consequently young chicks can contract the disease by contact with carriers, or by running in yards which have been previously occupied by carriers.

It has been shown, also, that not only are carrier hens a potent means of propagating the disease, but also, as a result of infection of their ovaries, egg production is much reduced, so that these birds are not a paying proposition in a flock from the point of production alone.

It has been found that carrier birds show the presence of certain substances (agglutinins) in their blood, such being produced by the body in response to the stimulation caused by the presence of the organism in the genital organs. It is possible to demonstrate the presence of these agglutinins, and thus recognise carriers, by the application of a test to the blood serum of the bird. For this test a small quantity of blood is withdrawn from one of the veins on the inner aspect of the wing, and after allowing the blood to clot, the serum is removed and tested.

Treatment and Control.

Should an outbreak of bacillary white diarrhoea occur, prompt action is necessary to prevent the spread of the disease to healthy chicks. Attempts to cure affected chicks are of no avail, and moreover, are inadvisable in that in the event of recovery they may continue to harbour the causal organism, and thus are potential sources of infection for future outbreaks. All affected chicks should therefore be destroyed and their bodies burned.

Chicks which have survived an outbreak should never be used for breeding purposes. If the number of survivors is small, it is best to destroy them, as it is found that up to 50 per cent. of them will develop into carriers. The contacts should be isolated on fresh ground, and thorough disinfection of the utensils and runs which have been used for the diseased chicks should be carried out.

It is advisable to refrain from using, for at least one season, yards which have been infected. Such yards should be treated by turning up the soil and applying a liberal dressing of quicklime.

Lantana Fly in the North Coast Districts.

Recent investigations in the North Coast districts by Mr. R. N. McCulloch, Assistant Entomologist, show the lantana fly (*Agromyza lantanæ*) to be now so widespread that there is no need for its further establishment, and as it has been known to be extensively distributed during the past seven years any tangible control which it may exert should soon become apparent. Specimens of the moth *Crocidosema lantana*, which is reported to be widespread, were also obtained. While the fly and moth are probably exerting some control by destroying the fruit and reducing the seed output and distribution, sufficient seeds still escape destruction to ensure a ready spread of lantana. A plot of lantana has been selected near Grafton Experiment Farm, and additional flies have been liberated for the purpose of determining whether complete control can be anticipated. The fly *Agromyza lantanæ* is also common on lantana in Sydney.—W. B. Gurney, Government Entomologist.

Poultry Notes.

JUNE.

JAMES HADLINGTON, Poultry Expert.

The Export Market.

AT the present time all eyes are turned to the question of export, because it is fully realised that upon successful export at a payable price, during at least three months of the year, depends the future prosperity and even the very existence of specialised poultry-farming in this and at least two other States.

It is well to recognise at once that this experience has befallen practically every primary and many secondary industries. Most of them have struggled through and have emerged with success, and it is not to be supposed that the poultry industry will prove any exception to this rule.

The question of exporting " on consignment " or on the basis of " f.o.b., Sydney," is agitating the minds of both individuals and associations, but it must be left for farmers to decide for themselves. The conditions attached to one or the other may well be the determining factor for good or ill.

The Question of Grades.

One of the vital questions in connection with export is that of grading. Hitherto only one grade has been sent from this State, and New South Wales is foremost in the matter of export of eggs in shell from Australia. This will be seen from the following little table showing the number of cases (each 30 dozen) exported from each State last year :—

	Cases.
New South Wales	26,000
Victoria	11,000
South Australia	8,000
Western Australia	3,000

The quantity exported by other States previous to last year was negligible. New South Wales has exported eggs in shell for several years now, and during the last few years the average has been over 20,000 cases per annum. South Australia has exported more eggs in pulp, but the price is stated to have been unsatisfactory.

At the recent conference of representatives from Victoria and South Australia with members of the executive of the Poultry Farmers' Association the question of grades for export loomed large, and was the most contentious matter with which the conference had to deal.

The grades suggested by Mr. Merrett, backed by the Victorian representatives, were as follows :—

14 lb. per 10 dozen eggs, to contain nothing less than $1\frac{3}{4}$ oz. to $1\frac{7}{8}$ oz. per egg.

15 lb. per 10 dozen eggs, to contain nothing less than 1⅞ oz. to 2 oz. per egg.

16 lb. per 10 dozen eggs, not to include any egg less than 2 oz. to 2¼ oz. per egg.

18 lb. per 10 dozen eggs, not to include any egg less than 2¼ to 2½ oz. per egg.

A good deal of discussion ranged round this question. It was contended by the advocates of these grades that they were necessary to the establishment of an export trade; but the representatives of this State were most emphatic that there was no necessity to burden the industry with such fine grading, particularly as our export season only covered about three months of the year.

In debating the question the writer stressed that New South Wales consignments from the Producers' Distributing Society, Ltd., appeared to have given every satisfaction in London, and that they had made prices very close to the best brands imported into Great Britain. These eggs were of one grade, averaging 2 oz., with a minimum of 1¾ oz. The Producers' Distributing Society's Advisory Council were not in favour of any other grade being sent, neither did there appear any necessity to make others so far as London was concerned. He stated that the facts in this connection were that, in the first place, such fine grading would increase the cost of packing and lower the average price of eggs to the farmer from the fact that so many eggs (calculated at 15 per cent.) would go into the lower grade if a 2-oz. minimum were insisted upon, while the special grade of 2¼ to 2½ oz. would in a very short time become the recognised first grade without the special price which might, at first, be obtained. It was further pointed out that a special grade of 2¼ to 2½ oz. eggs would represent only about 20 per cent. of the eggs marketed. A calculation showed that such a grade would have to realise 1s. 8d. at its cheapest wholesale price to compensate the farmer for the under grades it would leave behind, which would mean 2s. per dozen retail in the cheapest season of the year for this grade. The danger in making a super grade was that not only would it impoverish the grade now sold as first, but it would soon become recognised only as a first grade without the special price. Moreover, to export such a super grade meant that only smaller eggs would be left for home consumption, and that was undesirable.

After considerable discussion, however, a resolution was carried recommending that regulations covering export should be as follows:—

14 lb. pack per 10 dozen eggs shall contain no eggs less than 1½ oz. weight.

15 lb. pack per 10 dozen eggs shall contain no eggs of less weight than 1¾ oz.

This resolution was subsequently submitted to the annual meeting of the Poultry Farmers' Association, and received its endorsement. It may, however, yet have to run the gauntlet of another and more representative Interstate conference, and cannot therefore yet be regarded as final.

Admittedly we should aim to make the best possible reputation for our eggs on the other side of the world, so as to build up a big export trade, but it will be time enough to make higher grades when they are demanded, which they are not at present. The grades mentioned by Victorian representatives are those suggested by South Africa and Canada, which countries have had very much less experience in exporting eggs than has this State. Again, as far as Canada is concerned, that country, in its endeavours to export, must face the fierce competition of the whole of Europe and America, their seasons being identical, whereas we in Australia produce the bulk of our eggs in the opposite season, and are consequently much advantaged. Be it remembered, European countries can no more produce eggs in quantities out of season than we can, and eggs exported to Great Britain that come into competition with ours must of necessity have been kept over many months, whereas in our case it is not many weeks (say, about nine) between the eggs being laid and their going into consumption.

English "Home" Grading.

If any further evidence is required in support of the contention that our present export grades are satisfactory, it will be found in the following extract from an official report on egg marketing in England and Wales :—

"*Weight Grades.*—It would appear from the general evidence that the average weight standard of home-produced eggs can be put at 2 oz. each, or 15 lb. per 120. The London Egg Exchange has ruled that an allowance of ¼ lb. per 120 eggs less than the declared weight is permissible for imported supplies. If this margin were accepted for home produce it would be desirable to adopt a grading scale rising by 1 lb. per 120 eggs. This would require very close grading, and lead to difficulty in dealing with the innumerable small consignments which make up the trade in home-produced supplies. A tolerance of ½ lb. per 120 eggs, as in northern Ireland, would be more suitable for British conditions, and also allow for lack of skill in grading at the outset. Moreover, the adoption of this margin in northern Ireland was considered necessary to cover the difference in natural weight between spring and autumn supplies. Weight grading is, in any event, but supplementary to grading for inferior quality, which must and should always rank higher in importance with home-produced supplies. Further, since there are so many small buyers engaged in the home trade, and the eggs themselves cover a wide range of weights, it follows that close grading is not only undesirable in itself, but might result in the holding up of consignments. This is the last thing that should happen to home-produced supplies."

Meat Meal Feeding Experiment.

It will be remembered that in 1924–25 a series of experiments were commenced at Hawkesbury Agricultural College to determine what amount of meat meal it was most economical to feed in the ration for laying hens.

The morning mash fed to each section, in conjunction with a grain ration of two-thirds wheat and one-third maize for the evening meal, was as under :—

Pens 1 and 2.—Pollard, 66⅔ per cent.; bran, 33⅓ per cent.; meat meal, nil.

Pens 3 and 4.—Pollard, 65 per cent.; bran, 32½ per cent.; meal meal, 2½ per cent.

Pens 5 and 6.—Pollard, 63⅓ per cent.; bran, 31⅔ per cent.; meat meal, 5 per cent.

Pens 7 and 8.—Pollard, 61⅔ per cent.; bran, 30⅚ per cent.; meat meal, 7½ per cent.

For the first year the experiment was conducted over the flush period, September to March inclusive, and the results for that period were published in the *Gazette* in July, 1925, page 522.

The experiment was continued, and it is now possible to give results covering a full twelve months from 1st May, 1925, to 30th April, 1926. The figures are as follows, there being forty pullets again in each lot :—

—	Meat Meal.	May, 1925.	June, 1925.	July, 1925.	Aug., 1925.	Sept., 1925.	Oct., 1925.	Nov., 1925.	Dec., 1925.	Jan., 1926.	Feb., 1926.	Mar., 1926.	April, 1926.	Total.	Aver- per Hen.
	Per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1 ...	Nil.	101	116	396	547	629	629	467	526	431	311	200	10	4,363	109
„ 2 ...	2½	145	263	399	669	650	718	669	584	578	345	308	101	5,429	135
„ 3 ...	5	231	257	396	694	685	693	554	567	395	291	256	93	5,112	127
„ 4 ...	7½	257	329	509	761	774	727	606	616	544	346	313	100	5,882	147

An analysis of the figures for 1925–26 proves them to be in some respects contradictory, some abnormality having apparently occurred in some of the pens. The results are therefore inconclusive. For instance, in this experiment the lot fed 2½ per cent. meat meal gave 1,066 eggs over the "no-meat meal" group, while the 5 per cent. group showed only 749 eggs over the "nil" group; the 7½ per cent. group, again, gave 1,519 eggs over the "no-meat meal." In this experiment the meat meal was some points below the standard in protein content compared with that used in the 1924–25 test, so that the results from the lot fed 7½ per cent. in this experiment lose some of their significance.

With regard to the condition of the birds, the same feature was in evidence in this test as in the previous one, there being a very noticeable falling off in the concluding months in the "no-meat meal" group, and the birds finished up showing not only a largely-reduced egg production, but marked evidence of fag.

Maize Feeding Experiment.

The laying down of this experiment was not due to any doubt in the minds of officers of the Department as to the value of maize for poultry, but in order to show by data that the advice tendered in this regard was both scientific and practicable. Maize feeding has been consistently advocated

in these notes—that is to say, it has been maintained that maize should form a part of the ration fed to poultry. The question became a live one last year when maize was 4s. per bushel while wheat was 6s. and over. Many poultry-farmers, imbued with the old fallacy that maize was too fattening, refrained from feeding that grain as much as might they have done with safety. However, a request from the Aylmerton branch of the Agricultural Bureau brought the matter up for consideration on the question of data, and the experiment was arranged. While to some extent contradictory in respect of different proportions fed (doubtless due to some abnormal factor present), the results appear to show that the use of maize has been amply vindicated.

With regard to experiments generally, certain allowances have always to be made for what are known as experimental errors, and the irregular results shown in both this and in the meat meal feeding experiment above should convey a lesson of no small importance to those poultry-farmers who are inclined to experiment with everything and to come to a conclusion on a single test—often carried out under conditions anything but even.

In this trial the lots consisted of twenty pullets each. The grain ration of Lot 1 consisted of maize only; Lot 2 received two-thirds maize and one-third wheat; Lot 3 was given two-thirds wheat and one-third maize, and the grain ration of Lot 4 consisted of wheat only. Results:—

—		May, 1925.	June, 1925.	July, 1925.	Aug., 1925.	Sept., 1925.	Oct., 1925.	Nov., 1925	Dec., 1925.	Jan., 1926.	Feb., 1926.	Mar., 1926.	April, 1926.	Total.	Average per Hen.
		eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1	...	151	159	277	320	331	345	328	340	378	186	240	90	3,145	157
„ 2	...	114	149	207	293	273	346	287	208	275	139	152	67	2,600	130
„ 3	...	166	195	264	315	348	342	335	335	345	200	245	57	3,147	157
„ 4	...	135	153	224	308	275	304	312	296	327	145	116	12	2,607	130

Sheep Blow-fly Experiments.

In the January and February issues of this Journal the results of the experiments carried out by the Department at Midkin Station, Moree, for the purpose of determining the range of flight and longevity of sheep wool blow-flies, were published. In connection with this work, the Department desires to place on record the practical interest which was taken in the matter by the Pastoral Committee for the investigation of the Blow-fly Pest. That body, realising the importance of this work, made the generous offer to contribute up to £300 towards the cost of the experiments. Its decision to render such valuable assistance is highly appreciated by the Department, and will undoubtedly be regarded with satisfaction by pastoralists throughout the State.

The Department has already acknowledged in these columns the valuable help rendered by the Manager of the Midkin Station (Mr. C. C. Walker), and the local Stock Inspector (Mr. H. N. Copeland), in connection with these experiments.

Orchard Notes.

June.

W. J. ALLEN and H. BROADFOOT.

PRUNING should be pushed ahead this month, as it is always advisable to be ahead with this work.

In the case of young trees the development of a good framework is the chief desideratum. A tree must be built up with good strong limbs able to hold the weight of fruit; so for the first few years it is advisable to cut the leaders well back. On many orchards when limbs have been allowed to outgrow their strength and to commence cropping before they are strong enough to carry the weight of fruit the results have been disastrous. Limbs have broken and bent, trees have become stunted, and the small quantity of fruit harvested has been very poor compensation for the damage done. First plant, and then build a good tree. The cropping which ensues is then almost sure to be satisfactory.

After a good framework has been developed, and if the tree is still making heavy growth, it is usually advisable to allow the tree to go unpruned for a season. This will have the effect of inducing it to crop.

In pruning older trees the characteristics of the various kinds and varieties must be taken into consideration. The pruner should remember that peaches crop only on the previous year's growth, and the older wood will not retain a permanent, self-replacing fruit spur like the apple or pear. In old apple and pear trees, it is sometimes necessary to thin out the fruit-bearing spurs, or they become too crowded.

There is no hard and fast rule that applies to pruning, there being so many factors that influence the tree—such as soils, location, stocks, and general treatment in such matters as spraying, cultivation, and manuring. Each tree of each variety must be treated individually, and given the particular treatment that will result in the greatest annual production of good fruit. To do this well the habits and conditions of each tree must be closely studied.

Some of the main objects of pruning are as follows:—

1. The economic working of the orchard as regards cultivation, picking, and spraying.
2. The production of good bearing wood.
3. The improvement of size and colour of fruit.
4. The inducement of regular cropping.
5. The preservation of the health of the tree.
6. The treatment of the tree so as to allow warmth and light to reach its central axis.

Concerning Ladders.

On most orchards the ladder is in very frequent—indeed in almost constant—use in the picking of fruit and pruning of trees, and it is surprising how careless many growers are with respect to the provision, use, and care of a good serviceable ladder. In many orchards one sees a huge heavy ladder which one man lifts from tree to tree with difficulty, which is so constructed that it cannot be conveniently placed to enable the operator to carry out his work expeditiously, and which often damages fruit spurs and fruit when being placed in position. Some ladders are in the last stages of decreptitude, some have lost steps, some are so rickety that if the ground is a little uneven they require to be supported while the operator is pruning or picking. Orchardists should take stock of their ladders, and if they have not done so already they should secure a strong light serviceable ladder, the use of which will economise time and labour.

Planting.

Where deciduous trees and vines are to be planted this season it is advisable to start the work as soon as possible, as root growth commences long before the trees commence to shoot in spring. If the planting is delayed root growth takes place in the nursery, and is wasted when the tree is transplanted later. If the soil is dry it would be as well to defer planting until rain has fallen.

When trees arrive from the nursery they should be carefully examined for any disease or insect infestation, and any poorly developed trees should be rejected. The trees should then be placed in a trench and the roots covered with fine, moist soil, from which they can be removed for planting as required. When planting, avoid wet weather and also dry winds. It is a good plan if the day be hot and windy to have a puddle hole, and to dip the roots in it as they are removed from the trench. The trees should be planted at the same depth as they were in the nursery.

A leaflet on laying out and planting may be had on application to the Under-Secretary, Department of Agriculture, Sydney.

Citrus Fruits for Export.

The production of citrus fruits has increased enormously during the last few years, and the disposal of the crop may cause some concern to thoughtful growers. The seriousness of the position is more acutely realised when one reflects upon the competition of other countries in which citrus fruits are grown. Still, no matter how great the difficulties are, they can be overcome by application and determination. The essentials of success are quality and economy in production, thorough standardisation in grading and packing, and intelligently directed distribution. There can be no doubt that an overseas outlet for our surplus citrus fruits must ultimately

be found, and there are certain conditions which must be observed by those concerned in growing, grading, and packing, if satisfactory results are to be achieved.

There must be care in handling. Many growers have not yet accepted or recognised the fundamental fact that care in handling is absolutely essential to successful export. The skin must be kept in a sound, unbroken condition. Broken skins give access to rot organisms, which, having gained entrance, quickly effect the decomposition of the fruit. It is not an uncommon thing to see growers carelessly plucking fruit from the tree, or if the fruit is clipped leaving long stalks which cause damage by puncturing the fruit when it is put into bag or case.

The fruit is often dropped into the picking bags, or poured carelessly into boxes into which nails or splinters project. It is often jolted over rough roads, and on reaching the packing sheds is just as roughly treated as on the orchards or in transit. Cases are often stacked on the bulge, and are frequently walked over, so that undue pressure is placed upon the contained fruit. Is it any wonder that adverse reports often come to hand respecting the condition in which fruit is placed upon the market? Frequently and unfortunately the results of careless treatment are not apparent until after the fruit has left the orchard, and this causes serious misunderstandings between growers and agents.

Some of the most important points to be observed in connection with the export of citrus fruits are as follows:—

(*a*) Do not pluck the fruit; clip it close to the button.
(*b*) Handle with extreme care.
(*c*) Do not drop the fruit into picking bags; place it carefully.
(*d*) Pour the fruit carefully from picking bags to boxes.
(*e*) The boxes should be carefully examined and all protruding nails and grit removed.
(*f*) Do not jolt the fruit over rough roads.
(*g*) Grade carefully for quality, and send no fruit that is not of high standard.
(*h*) See that the sizing machine is working properly, and that none of the fruit is too tightly squeezed or jambed.
(*i*) Use a good clean case.
(*j*) Use a good quality wrapper.
(*k*) Pack neatly and tightly.
(*l*) Stack cases on their sides.
(*m*) Do not export large, coarse fruit.
(*n*) When navel oranges are shipped exclude freaks.
(*o*) Do not export misshapen fruit or fruit with loose puffy skin.

Oranges intended for export should be clean, well-shaped, fine-skinned, juicy, not raggy, well flavoured, and possessing good carrying qualities.

Fungous Diseases.

Powdery mildew is very much in evidence in many apple orchards, and growers would be well advised to give every attention to it. When pruning this winter, the removal of all infected twigs will greatly assist in keeping it in check. This should be followed later on by spraying with colloidal atomised, or atomic sulphur. A leaflet on the control of this mildew may be had on application to the Under-Secretary, Department of Agriculture, Sydney.

Insect Pests.

A strict watch should be kept for San Jose scale and if necessary the trees should be sprayed with miscible oil or lime-sulphur.

Apple trees which are badly infested with woolly aphis should receive a spraying of tobacco wash. A good pressure is essential to break up the clusters of aphis.

Ploughing.

The ploughing of existing orchards may be started this month. The soil is then in a condition to absorb the maximum amount of rain that falls during the winter, and to store it up for the use of the trees in spring and summer. It is impossible to forecast what the season is going to be, and if the ploughing be delayed later than the beginning of September there is a possibility that the trees and the crop will be adversely affected.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society and Secretary.	Date.		Society and Secretary.	Date.	
Peak Hill (T. Jackson)	July	27, 28	Melbourne	Sept.	16 to 25
Tullamore (C. S. Pryke)	Aug.	3, 4	Lockhart (E. D. Arnold)	,,	21, 22
Brisbane	,,	9 to 14	Murrumburrah (W. Worner)	,,	21, 22
Trundle (H. E. Mullins)	,,	10, 11	Canowindra (J. Rhue)	,,	21, 22
Condobolin	,,	17, 18	Temora (A. D. Ness)	,,	21, 22, 23
Gilgandra (D. Christie)	,,	24, 25	Boorowa (W. Thompson)	,,	22, 23
Wagga (F. H. Croaker)	,,	24, 25, 26	Henty (J. Lovell)	,,	28, 29
Bogan Gate (J. Egan)	,,	25	Barellan (J. Doherty)	,,	29
Cootamundra (W. W. Brunton)	,,	31, Sept. 1	Barmedman (W. Pemberthy)	,,	29
Grenfell (T. Weneham)	,,	31, ,, 1	Hillston (J. Pevers)	Oct.	1
Parkes (L. S. Scaborn)	,,	31, ,, 1	Cudal (H. W. Ford)	,,	5, 6
Forbes (E. A. Austen)	Sept.	7, 8	Ardlethan (R. L. Neill)	,,	6
Young (T. A. Tester)	,,	7, 8, 9	Quandialla (V. G. Talbot)	,,	6
Gunnedah (M. C. Tweedie)	,,	7, 8, 9	Hay (R. Eager)	,,	6, 7
Lake Cargelligo (J. Costella)	,,	8	Narrandera (W. H. Canton)	,,	12, 13
Ganmain (C. C. Henderson)	,,	14, 15	Ariah Park (J. McInness)	,,	13
West Wyalong (F. A. Smith)	,,	14, 15	Carcoar (J. Brady)	,,	13
Cowra (E. Todhunter)	,,	14, 15	Griffith (M. K. Sellin)	,,	19, 20
Manildra (J. Longley)	,,	14, 15	Deniliquin (P. Fagan)	,,	19, 20
Junee (G. W. Scrivener)	,,	14, 15	Lismore (H. Pritchard)	Nov.	16, 17, 18
Singleton (S. Griffits)	,,	15 to 18	Coramba (H. E. Hindmarsh)	,,	30, Dec. 1

1927.

Society and Secretary.	Date.		Society and Secretary.	Date.	
Dapto (E. G. Coghlan)	Jan.	14, 15	Glen Innes (G. A. Priest)	March	8, 9, 10
Kiama (G. A. Somerville)	,,	25, 26	Taree (R. Plummer)	,,	9, 10, 11
Newcastle (E. J. Dann)	Feb.	15 to 19	Camden (G. V. Sidman)	,,	31, Apl. 1, 2
West Maitland (M. A. Brown)	March	2 to 5	Sydney Royal (G. C. Somerville)	April	11 to 20

Agricultural Gazette of New South Wales.

Fallowing Competitions, 1925-26.

SOME OF THE JUDGES' REPORTS.*

Parkes and Forbes.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

THE judging of the fallowing competitions was completed under rather difficult conditions, owing to the heavy rains of the latter period of March, and the frequent storms experienced during early April. Judging was commenced on 15th March, and half of the number of the Parkes entries were submitted under ideal judging conditions, as rain of any appreciable amount had not fallen during the extremely hot summer. On 17th March, heavy rains commenced, making re-inspection of these areas necessary at later dates, as they had altered considerably in vital essentials. Judging was completed on 12th April, under equitable seasonal conditions for all entries.

The heavy rains of June, and the light, frequent showers of July, 1925, generally delayed the ploughing of the fallow, and the work continued until late August. Opportune rains, enabling fallows to be effectively worked, occurred at the end of October and towards the end of November. The summer was comparatively dry and hot, such conditions continuing until 17th March, 1926, when copious rains were registered throughout the district. With frequent storms in April, the warm, moist condition of the soil forced a wonderful germination of the weed seeds on the cropping areas. After the rains farmers had the cultivators busy wherever possible, destroying weeds, compacting the sub-surface soil, and re-making the mulch.

Improved Standard of Fallows.

The judging of a fallow competition to-day is a more difficult matter than it was three years ago, when usually the three leading fallows could readily be separated from the rest. Little faults that were hardly worthy of notice then have now become matters of considerable importance as a means of picking the winners. This indicates a higher average standard of work. Fallows are now worked more frequently, and where five workings used to be about the maximum, eight are now given. The average number of workings up till judging time which the ten fallows in the Parkes competition received in 1924 (including the ploughing) was 4·9, while the nineteen fallows competing in 1926 received 5·63.

* Owing to heavy demands upon space it is impossible to publish the reports of these competitions in full, but extracts have been made of those portions of greatest general interest.—Ed.

The heavy rains of March considerably improved the lower quality fallows, particularly the ones that were springtooth cultivated after the rain and before judging; the loose ones were compacted and any moisture deficiency eliminated, and yet the demarcation between the mulch, compacted soil, and ploughing depth was not interfered with in the higher standard fallows. I am sure the positions of the two leading fallows in the Parkes competition were not influenced by the rains, though perhaps the others were.

Implements.

It is very evident from data collected that changes in the kind of implements used when working fallow are taking place. Mouldboard ploughs are generally preferred in loams and sandy loams, and disc ploughs are only used in clayey loams in cases of emergency. Disc implements, such as the sundercut and disc cultivator, are used sometimes for working stubble land in the summer prior to the winter ploughing, for the first working of the fallow in self-mulching clayey loam country (if the plough is not being used), and for destroying excessive growth and rubbish on the fallow when the tine implements will not do the job. Disc implements are placed on the fallow only when necessity compels, as they certainly destroy the quality of the mulch, depth of mulch, and compactness.

Harrows are being kept away from the fallows in the lighter country, which runs together if too fine. Loamy to sandy loam soils are now mouldboard ploughed, and, if possible, worked only with tine implements.

The rigid-tine scarifier, with wide-winged points, though it is two horses heavier to draw than the springtooth cultivator, is coming into favour. It certainly does good work, aids in compacting the soil, and cuts out rubbish almost as well as the disc cultivator. The springtoothing is now generally done with a combine, which is rather more effective than the older type of springtooth cultivator.

Plough for Fallowing.

An opportunity was again presented during the judging of inspecting fallows which had not been ploughed, but which had been worked two and three times during the winter with the springtooth cultivator. Two of the fallows were of a light loam, and one of a clayey loam self-mulching soil. My impression still is that on loam to light loam the practice cannot be recommended, but on the self-mulching heavy country it is satisfactory, provided a ploughing is occasionally given to turn under vegetable matter and to destroy any tendency towards the formation of a hard pan. With one fallow of the former class it was distinctly noticeable that the sweetened soil was of a depth of only 3 inches, thus limiting fertility, and the other, while it had been worked deeper, I think had been too "tight" during the spring months. Of course, as far as conserving moisture and securing compactness during a dry summer and autumn is concerned the practice answers well, but it seems that it must be at the expense of aeration and fertility. In

the case of the heavy soil, it was interesting to note the soil condition when inspected prior to the March rains. There was a fine loose dry mulch of 2 inches which, when scraped away, revealed a fairly dry honeycombed strata, with cracks a quarter of an inch wide, to a depth of another 3 inches. At the depth of 5 inches from the top of the mulch the sub-soil was puggy. The last appreciable fall of rain had been in November. It is contended that the natural cracking of this sub-surface soil during every summer is sufficient aeration. The loams and lighter soils do not crack in this way.

Corowa.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

The competition attracted forty-two entries, which was particularly gratifying, as the season was one in which most farmers were disappointed with the condition of their fallows, not having been able to cultivate them as frequently as desired on account of the extremely dry spring and summer.

It is unfortunate that the fallows could not be judged before the recent rains. The fact that about 2 inches of rain fell on most of the fallows just prior to judging precluded the possibility of estimating the amount of moisture stored in the fallows by good cultivation methods. After inspecting some of the fallows it was decided to allot the same number of points for moisture to each fallow.

The fallows were spread over a wide tract of country, practically every locality in the district being represented, and including every type of soil from light sandy loams to heavy black clay country.

An effort is now made by Riverina farmers to get the fallows ploughed early in the winter (June for preference). Summer fallowing is also beginning to receive some consideration, and it is a practice that can be strongly recommended. Land can either be ploughed or cultivated with a disc or tine implement in February or March instead of June or July. If cultivated in the summer in this way it is then ploughed in the winter, though if the land is not weedy it is not always ploughed in the winter, being simply treated as a cultivated fallow. With either a winter or a summer fallow it is advisable to cultivate it in the spring before the moisture begins to evaporate, going to the full ploughing depth and using fine points in the springtooth cultivator After this it is only necessary to cultivate as required to break the surface crust formed after rain or to destroy weed growth. All these subsequent cultivations should be shallow (about 2 inches deep).

The spiked roller is a favoured implement in the Corowa district, and provided it is used with judgment it is a splendid implement. It has greatly assisted the consolidation in many of the fallows this season. To assist consolidation it should only be used towards the end of the fallowing season (March). Prior to that it is inclined to break the clods down too much and

render the surface too fine. It should always be followed by the harrows or tine cultivator. Never leave a rolled surface! Some of the competitors were inclined to use the roller to break down clods that would have been better in their original size; rolling is not a wise practice unless the land has broken up exceptionally rough and the clods are overlarge and obstinate. Keep in mind the fact that you are endeavouring to maintain a surface composed of clods varying in size from 2 to 4 inches in diameter.

Cumnock.

B. M. ARTHUR, H.D.A., Agricultural Instructor.

The number of entries (fifteen) for the competition at this centre was excellent for an initial effort, though finally only eleven were submitted to the judge for inspection, the balance being withdrawn at the last moment owing to damage by heavy rain, excessive weed growth, &c.

Heavy rains during March and April caused an abundant germination and growth of all classes of weeds, and in most cases the fallowed areas were still too wet to allow them to be cultivated. The majority of the fallows submitted for inspection, therefore, did not present the best appearance, and the judge's task of allotting points for mulch which was not evident in most cases was a difficult one. It was generally arrived at on the assumption of what the surface of the fallow was like, and the class of implement used prior to the rains. Full points were given in every case for moisture which had penetrated to a great depth, and in allotting points for cleanliness, notice was not taken of fresh weed growth since the rain, except in the case of wild oats.

The Principles of Fallowing.

It will be of interest to outline the essential principles of fallowing for the guidance of those interested in the improvement of their methods.

While, owing to the great variation in types of soils met with in any given district on the western slopes, it is not possible to lay down any hard and fast rules for working the soil, it is undoubtedly a fact that if certain methods, with modifications to suit the individual soils, are adopted, satisfactory results can confidently be expected.

The first essential perhaps is the conservation of moisture in the soil during the ten to fourteen months prior to sowing the crop, therefore the earlier the preparation of the soil the better in most cases. If the ground is known to be dirty with wild oats, thistles, &c., a springtooth cultivation or discing the previous autumn is recommended. This ensures that with the advent of suitable rains there will be an early germination of weeds, which can easily be kept in check by sheep until after seeding operations are completed, when the land should be ploughed as soon as possible to an even depth, which on most classes of soil need not be more than 4 inches. It is also advisable to

turn under as much green growth and straw as possible, as this will augment the humus in the soil, which is so essential to a good tilth, and to the maximum activity of useful types of bacteria. It is very important to create as suitable conditions of moisture and soil temperature as possible for these soil bacteria, as upon their activity depends the availability of plant-food under the chemical processes of oxidation and nitrification.

While bearing these factors in mind, the farmer must not lose sight of other essential factors in the preparation of an ideal seed-bed, namely, the compactness or consolidation of the sub-surface soil or of that layer of soil between the surface mulch and the original ploughing depth. The control of weed growth during the summer must receive attention, and also the prevention of loss of moisture by means of a suitable mulch. If the ground is known to be dirty an early harrowing is advisable to break down the plough furrows and to fine the soil, in order to induce the maximum germination of weed seeds. With reasonably clean ground, however, the first operation after ploughing should be a cultivation with a tine implement down to the full ploughing depth, in order to bring many clods (dry and otherwise), which had been ploughed under, to the surface, thus avoiding air pockets, which prevent consolidation and allow too great an aeration of the soil. During this cultivation the finer particles of soil are sifted down to fill up the spaces originally occupied by the aforementioned clods, and from that time forward compacting of the soil will be gradually brought about by the subsequent necessary cultivation, by the use of sheep, and by the rains which may fall on the fallow. This cultivation should be done before haymaking operations commence.

Thereafter all subsequent cultivations should be carried out after any and every serviceable fall of rain, with the object of keeping a loose mulch surface, and to prevent moisture evaporating and the growth of weeds. The best implements to use are the harrows, or tine implements, such as the spring-tooth, scarifier, &c. The various disc implements are often used, generally to deal with weed growth which has got out of hand, but these should be avoided as much as possible as they tend to spoil the fallow, especially if used in the autumn, firstly by going too deep and affecting the consolidation, and secondly by fining the surface soil so that it then has a tendency to run together and set hard after rain. An effective mulch need not be deeper than from 2 to 2½ inches.

It is quite recognised that when weeds, such as black thistles, saffron thistle, Mexican poppy, wild oats, &c., get out of hand, the only implements which will deal effectively with them are of the disc or skim plough types, but a cultivation at the right time before the weeds make too much growth, and the judicious use of sheep by the farmer, can largely prevent this.

In conclusion, I would again stress the main factors in the production of a good fallow :—

(1) Early ploughing or cultivation of the land to conserve moisture and rid the soil of weed and fungous pests.

(2) A deep primary cultivation in the spring to bring all clods to the surface, thus aiding consolidation.

(3) The judicious working of the fallow when necessary, which combined with the aid of sheep will help to produce the ideal seed-bed.

(4) The avoidance of the use of disc implements where practicable.

(5) The obtaining of a shallow mulch with a nicely clodded surface which will prevent evaporation of moisture, erosion and washing of soil, and the crusting of the surface.

Riverina District.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

The increasing popularity of fallow competitions in this district is evidenced by the number of associations that held their initial contest this season. This is the more commendable in view of the dry spring and summer. The interest and keenness of the farmers was most marked; many who knew they had no chance of winning entered simply for the benefit of the information and knowledged to be gained.

The value of sheep in conjunction with fallowing is being recognised more and more in many parts of the Riverina and they are now being made a good deal more use of. Oats are rapidly coming into prominence and even where they cannot be grown successfully as a commercial crop farmers recognise their value, in conjunction with sheep, as a rotation crop for wheat, which improves the texture of the soil for the ensuing wheat crop. The fertility is increased both by the cultivation of the oat crop and the action of the sheep. The sheep being grazed on the stubble trample what straw they do not eat, which, with their droppings, forms a substitute for farmyard manure and is readily ploughed in; later on when the fallow is ploughed, sheep assist largely in keeping down weed growth and in consolidating the seed-bed by the treading the fallow receives, without forming hard surface patches. The carrying capacity of the land is increased, and diseases and noxious weeds are checked, and to a large extent eradicated. To obtain the full benefit from these advantages, it is necessary to follow a wheat crop with an oat crop. This system is rapidly gaining favour in the Riverina and the rotation is simple and inexpensive. After the wheat harvest, the stubble is grazed for a couple of months and then if there is still too much to plough in, it is burnt. The area is cultivated and then sown in March with oats which can be grazed, cut for hay, or left for grain. The land is then fallowed the following season in the usual way for the next wheat crop. Many farmers are now growing oats in this manner, firstly because of the rotation, and secondly because it gives them oaten hay for stock fodder. Several cases of infestation of flag smut have been known through feeding stock on infected chaff, and the feeding of oaten hay or chaff prevents this.

If diseases such as take-all, foot-rot, or flag smut, or weeds are troublesome the stubble of the preceding crop should be sacrificed and burned as thoroughly as possible. This burning will destroy fungous spores and weed seeds, and will at least singe the hairs of the wild oats that are lying on the surface of the soil, causing the seeds later to germinate fairly readily.

Another system that is extending very largely is that of an ordinary summer fallow without the sowing of oats. The stubble is burnt for the reason just mentioned and the land either scarified or springtoothed as soon as summer rains will permit. This forms a suitable seed-bed for the early germination of black oats and also helps to germinate and clean the land of fungous diseases. Breaking the surface also allows the summer and autumn rains to penetrate the soil and facilitates the early winter ploughing.

An implement that is coming into prominence in the Riverina of late and doing very good work is a duckfoot or rigid-tined type of scarifier. It is an excellent implement used in the correct manner, but a lot remains to be learnt as to its more efficient use. Some farmers have tried to work the fallow wholely by the scarifier, but on the typical wheat loams this is not the most profitable working, as on these soils it has been demonstrated that the winter ploughing for the aeration of the soil, followed by a deep combing with the springtooth to lay the foundation of the seed-bed, is necessary for the best results. The scarifier is an excellent implement for the subsequent summer workings as it loosens up the surface without breaking down the mulch, it levels off the seed-bed and makes an even depth of mulch, which just prior to seeding is a very important operation, and it cuts most weeds, a good many of which (especially thistles and melons) would be left by the springtooth. This practice will very often save the use of the disc, which is deprecated except under very drastic circumstances, such as if the melons are not got on to before they grow too big, as they will then often choke the scarifier. It is found that sheep will not keep down melons completely. They eat the young ones, but if the melons are any size and thick they nose them over and only eat the berries and young shoots from underneath. If the sheep let the melons get any size it is wise to put the scarifier on and cut them out, as otherwise the disc will have to be used late in the season prior to seeding—an operation to be particularly avoided if possible.

In parts of the western district of the Riverina a good deal of country occurs that is similar to that of the Wimmera, being "plain" country of a heavy self-mulching clay loam type. It is on this country that the scarifier can be used to advantage. This soil is often too heavy to plough, and if ploughed, generally mulches to the depth of cultivation, making it difficult to form a suitable seed-bed in the one season. The cultivation rule for this country is "shallow and often." Commencing with summer fallowing and practising this rule, good results should be obtained from this country.

Farmers' Experiment Plots.

WHEAT AND OAT TRIALS, 1925

North-western District.

C. McCAULEY, Agricultural Instructor.

THE following farmers co-operated with the Department in conducting cereal experiments during 1925:—

N. W. Webb, "Roselan," Wee Waa.
R. Smith, Eulah Creek, Narrabri.
A. W. Panton, Basin Plain, Gunnedah.
G. L. Houson, Bingara.
S. McDonald, Gunnedah.
T. Sweetman, Yarrie Lake, Wee Waa.
M. Mackaness, Yarrie Lake, Wee Waa.
E. Newnham, Wee Waa.
A. E. Philp, Bellata.
R. A. Stafford, Bellata.
H. Madden, Wee Waa.
E. Dufty, Mt. Rodd, Bingara.
A. Hulbert, Narrabri.
C. Lennox, Baan Baa.
D. V. Wilson, Boggabri.
C. Penrose, Wean, Boggabri.
L. G. Pryor, Kelvin, Gunnedah.
L. Latham, Baan Baa.
W. McDonald, "Inverness," Gunnedah.
W. O. Manning, "The Pines," Curlewis.
R. A. Studd, Boggabri.
A. M. Paterson, "Green Hills," Delungra.
Cosh Bros., Pallamallawa.
M. Daley, Nullamanna, Inverell.
J. H. McDonald, Boggabilla-road, Moree.
J. Miller-Williams, Pilliga.

The Season.

As regards wheat growing, the season just past was one of the most adverse ever recorded in the north-west. The crops as a whole were a failure, the only exceptions being those sown on either long or short fallow land. Excellent crops sown under these conditions were to be seen in all centres, yields of six to ten bags per acre being obtained from 3 to 4½ inches of rain during the growing period. Heavy rains fell during the previous November and December, but the autumn was dry, and no rain fell during April. Sufficient light showers fell during May and June to germinate the seed and enable ploughing to proceed. Crops sown during these months germinated well and made good early growth; those sown later either failed to germinate or came up very patchy. The spring was very dry, just sufficient rain falling to keep the crops alive. Hot drying winds were experienced during October and November, and were responsible for the failure of a number of crops; even

on fallowed land these winds caused the plants to ripen prematurely, thus considerably reducing the yield by causing the grain to be pinched. No good soaking rains were recorded during the whole of the growing period.

RAINFALL during the Growing Period.

	Wee Waa.	Gunnedah. (A. W. Panton)	Gunnedah. (L.G. Pryor)	Bingara.	Baan Baa.	Curlewis.	Pallamallawa.
1925.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
May	117	107	90	...	30	40	...
June	84	75	39	25	38	98	...
July	69	81	100	150	99	60	110
August ...	78	81	128	40	74	107	135
September ...	6	14	22	45	...	...	...
October ...	...	20	68	...	39	23	...
Totals ...	354	378	447	260	280	328	245

The Plots.

Wee Waa.—The soil was red to grey sandy loam; ploughed on 18th July, 1924; springtooth cultivated on 28th July, 24th September, 8th October, 3rd and 16th November; skim ploughed on 31st December; springtoothed on 5th and 26th January, 1925, 1st and 11th February and 24th March. Seed-bed was moist, clean and subpacked. Seed sown with combine drill on 11th and 12th May, at 45 lb. per acre; superphosphate at 60 lb. per acre.

The seed germinated well on all plots, and considering the dry season the plants made good growth, but the hot dry winds which occurred during early October caused the plants to ripen prematurely. Kangaroos also considerably reduced the yield.

Narrabri.—The soil was a heavy chocolate loam; last crop, maize, 1924–25; land ploughed on 20th February, 1925; skim ploughed on 28th April, springtooth cultivated crosswise on 8th June. The seed-bed was grazed with sheep and was in excellent condition. The seed was sown with a disc drill on 8th June at 46 lb. per acre. The germination and early growth were good, but the hot dry weather in September caused these plants to suffer severely; they were drought tipped and large patches died out. The results cannot be taken as strictly comparable. Rainfall figures not available.

Gunnedah (A. W. Panton).—The soil was red loam; previous crop, wheat in 1923. The land was ploughed in August, 1924; springtooth cultivated October and December, and just prior to sowing; sheep were run on the fallow. Seed-bed in good condition; seed sown with combine drill on 18th May at 45 lb. per acre; no manure.

Germination was good and plots made nice growth till the hot dry weather just prior to harvest pinched the grain.

Bingara.—The land (a red soil) was ploughed during October, 1924, previous crop having been wheat in 1923; skim ploughed in January; springtooth cultivated in March, April and May; seed sown with cultivator on 4th June at 45 lb. per acre; no manure.

Germination was good, and considering the dry season growth excellent; heads were well filled and grain plump. Clarendon plot was knocked about by rain, and it is estimated over a bushel of grain per acre was lost.

Baan Baa.—The previous crop was wheat in 1923; land ploughed on 18th January, 1925; harrowed on 10th February; disc cultivated on 26th March; disc and springtooth cultivated on 21st May; seed sown on 22nd May at 46 lb. per acre.

Gunnedah.—A chocolate soil that last carried wheat in 1924; ploughed in January, 1925; skim ploughed in April; springtoothed 19th May; seed-bed in excellent condition; seed sown on 19th May at 45 lb. per acre.

The seed germinated well and plants made vigorous growth, though yields were considerably reduced on account of dry winds experienced just before harvest. Rainfall not available.

Curlewis.—The soil was a stony red, previously cropped for wheat in 1924; disc cultivated mid-January; harrowed on 26th February; springtoothed on 15th May and just prior to sowing; seed-bed in good order; seed sown on 25th and 26th May at 45 lb. per acre.

The plots germinated well and made good growth, but hot dry winds considerably reduced the yields.

Boggabri.—The soil was a red loam; previous crop, wheat, 1923; land ploughed during September, 1924, and harrowed immediately afterwards; springtooth cultivated after harvest; sheep run continuously on the fallow; seed sown with combine drill on 11th May, at 50 lb. per acre. The rainfall during the growing period totalled 3·85 inches.

Pallamallawa.—Soil, a red to chocolate loam; previous crop, wheat, 1924; land ploughed in March, 1924; skim ploughed early May; seed-bed in good condition when sown with combine drill at 45 lb. per acre on 29th May.

Inverell.—A red loam soil, which previously carried wheat in 1924; land ploughed on 25th February; disc cultivated on 1st May; springtoothed on 3rd June; seed-bed in good condition when sown on 17th June at 58 lb. per acre. Rainfall during growth, 10 inches.

Wheat variety trials were also planted at the following centres, but failed :—

Bellata (Mr. A. E. Philp), Pilliga (Mr. J. Miller-Williams), Boggabri (Mr. C. Penrose), Delungra (Mr. A. M. M. Paterson), and Moree (Mr. J. H. McDonald).

Notes on Varieties.

Waratah, Canberra, and Hard Federation again proved themselves suitable on the light soils of this district. Waratah is the most suitable variety for all centres. Canberra is suitable in the drier centres, but its straw is too weak for the Inverell district; it is also very liable to rust. Waratah and Canberra were the two main varieties sown in last season's local field wheat competitions.

Gresley yielded well, but it is inclined to lodge. Bena, Aussie, and Duri are three promising varieties. Cadia and Cargo appear to be too slow growing for the drier portion of this district. They may suit the Inverell district.

Diseases.

The district last season was free from most diseases, the only one at all noticeable being flag smut. This disease was very noticeable in the Curlewis and Gunnedah districts.

VARIETY Trials with Wheat.

Variety.	Wee Waa.	Narrabri.	Gunnedah. (A. W. Panton)	Bingara.	Baan Baa.	Gunnedah. (W. McDonald.)	Curlewis.	Boggabri.	Pallamallawa.	Inverell.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Gresley ...	14 40	10 12	12 40	18 28	3 50	19 49	14 24	11 40	6 48	19 28
Canberra ...	13 48	...	...	...	4 35	...	...	...	...	19 42
Bena	12 37	9 1	15 36	25 21	4 55	10 0	14 0	14 52	8 0	19 40
Waratah ...	12 35	8 4	14 42	23 41	4 23	17 58	17 22	13 12	6 48	20 0
Barwang ...	11 56	...	...	...	...	...	...	9 43	...	...
Clarendon ...	11 20	...	14 30	16 40	5 39	17 7	15 3	...	6 55	19 20
Wandilla ...	10 5	Nil	17 41	20 26	5 20	...	12 36	...	6 20	20 10
Riverina ...	...	9 1	14 2	...	6 0	...	...	...	5 34	...
Cargo	...	...	15 30	18 57	3 20	17 40	...	7 0	...	...
Hard Federation	...	...	13 36	25 30	...	...	...	...	...	...
Gluyas Early (Farmer's seed)	...	...	...	Nil	...	...	...	...	...	...
Duri	...	...	...	...	...	23 36	...	...	...	...
Aussie (Farmer's seed) ...	...	...	...	...	...	17 18	...	...	...	...
Cadia	...	...	...	...	...	17 13	...	...	...	...

Oat Variety Trials.

Trials were sown at four centres, but at three—Bingara (Mr. E. Dufty), Wee Waa (Mr. E. Newnham), and Narrabri (Mr. H. Hulbert)—they failed owing to the dry season.

Gunnedah (L. G. Pryor).—A red soil that last carried barley in 1924; ploughed in December, 1924, springtooth cultivated on 8th March and 16th May; sown on 16th May at 40 lb. per acre; land harrowed immediately after sowing; crop fed off twice during growing period. Results :—

	bus. lb.		bus. lb.
Guyra...	20 14	Mulga...	11 26
Algerian	14 26	Lachlan	5 23
Myall	13 34		

Manurial Trials.

Manurial trials were conducted at Wee Waa (Mr. T. Sweetman), and Baan Baa (Mr. C. Lennox), with the following quantities of superphosphate :—nil; 30 lb. per acre; 60 lb. per acre; 90 lb. per acre.

The germination of the plots was very patchy and growth uneven; as a result yields were not comparable. The plots manured with 90 lb. and 60 lb. of superphosphate respectively made the best early growth, but were the first to dry off. During the early stages the plots treated with 30 lb. superphosphate looked no better than the unmanured; but later in the season they stooled better and suffered less from the dry weather than the unmanured areas.

A Fallowing Experiment.

An experiment was conducted at Gunnedah by Mr. S. McDonald.

No. 1 plot was ploughed on 1st September, 1924, and worked with springtooth cultivator, skim plough and harrows on six different occasions before sowing.

No. 2 plot was ploughed on 7th February, 1925, and received two harrowings and one springtoothing before sowing.

No. 3 plot was ploughed on 1st May, 1925, and cultivated once each with springtooth cultivator and harrows before sowing.

All three plots were sown with Waratah wheat at 45 lb. per acre on 20th May. The only one harvested was the first, from which 7 bushels 21 lb. per acre was obtained. The other plots failed, the rainfall of 2·89 inches proving insufficient to mature a crop under the conditions.

Similar experiments were conducted at Wee Waa by Mr. W. Mackaness and Mr. H. Madden, but both crops were destroyed by galahs. There was no noticeable difference between the growth of the long and short fallow plots, and considering the dry season they made good growth. The unfallowed plots failed.

Winter Fodder Trials.

Trials were sown at Boggabri (Mr. D. V. Wilson) and Bellata (Mr. R. A. Stafford), but in each case the seed failed to germinate.

Standardise Your Varieties.

If you grow peaches, grow a few varieties—not a host of them. The same applies to other fruits generally. The shopkeeper always likes to get a good line of fruit, such as navel oranges, Emperor mandarins, Jonathan apples, and so on. But of what use is an odd tree or so of this or that variety? Grow good lines of fruit in limited variety, and pack them in the right condition. They will largely push their own sale (a case or wo o one variety will not).

Another reason for bringing plantings more up to date is better contro over pests. A limited number of kinds is very helpful in combatin frui fly, codlin moth, and other troubles. Spraying and other work can be more methodically done by not having to stop to do that other job of looking after another variety.—W. Spinks, Frui t Inspector, at Windsor Agricultura Bureau Conference.

Field Maize Competition.

Royal Agricultural Society's Northern Championship, 1925–26.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.*

As some of the agricultural societies on the Northern Tableland had previously conducted field maize competitions and had the intention of continuing them last season, the Council of the Royal Agricultural Society conceived the idea of giving still further encouragement to this praiseworthy activity of the local societies, by stimulating an inter-district rivalry with offers of championship cups, valued at £20, £15, and £10 (on similar lines to the Field Wheat and Fodder Conservation Competitions), the winners in each local contest competing for championship honours.

Of the agricultural societies on the Northern Tableland which were invited by the Royal Agricultural Society to compete for the championship cups, the Glen Innes P. and A. Society was the most notable absentee, the local competition failing there through inability to arouse sufficient interest amongst maize growers in a rather adverse season for this crop. Other districts, however, were facing even greater seasonal hardships, and Inverell district (where the conditions were particularly harsh) came forward with six entries and secured the second championship cup—a very worthy and exemplary effort.

The districts which conducted local contests in the season under review, and whose winning crops competed in the Royal Agricultural Society's first Northern Maize Championship, were Tenterfield, Inverell, and Armidale. The number of entries in each local competition was rather small, the adverse seasonal conditions in each district being mainly responsible for the paucity of entries—particularly at Inverell, where in a previous competition fifteen crops were judged.

At the request of the Royal Agricultural Society the conditions of entry in each local competition were uniform—5 acres of crop of the same variety of one sowing in a continuous block on the farm being submitted for judging according to the following scale of points:—

	Points.
1. Germination or stand	10
2. Cultivation methods and weed control	25
3. General appearance, condition, evenness, &c., of crop	10
4. Freedom from insect pests and disease	10
5. Purity and trueness to type	15
6. Estimated yield—3 points for every 5 bushels of apparent yield.	

The plan adopted in judging was to make a first inspection about the tasselling or cobbing stage, or when cultivation had not long been completed, to allot the points under the first three headings, leaving the judging for type, yield, and absence of pests and disease until the crop was nearly ripe

* Extracted from the judge's report in the above competition.

or fit to harvest. Obviously the points under these latter headings cannot be given at an earlier stage, while weed control, evenness, and condition of crop are best judged much sooner.

With the plan adopted in judging (the writer acting as judge both for the local competitions and for the Royal Agricultural Society's Championship), the points scored by the winning crops in each district remained the same for the championship.

Although the three championship crops differed little, except in yield, the crops entered generally in the Armidale competition were superior to those of the other districts. Although primarily due to more fortunate seasonal conditions at Inverell and Tenterfield, the Armidale maize growers seem to appreciate better the importance of early ploughing as a means of creating a reserve of moisture in the soil, which will carry a maize crop through dry spells during its growth better than if it were depending mostly on the rainfall after planting.

These three were high class crops whose owners well deserved the honor of securing a Royal Agricultural Society's Cup. In each case there was a praiseworthy care and attention to detail which was reflected in the yield, and the competitions are bound to serve a useful purpose in demonstrating that the principles underlying a more intensive cultivation of maize, if applied as far as possible to the farm area, will result in better and more profitable crops. There is no crop, perhaps, in which the benefit from "a small area well tilled" could be demonstrated better than with maize, and the general tendency in farming throughout Australia to grab more land or to cultivate a larger area less efficiently may receive its overdue setback by the aid of such competitions. With increasing labour costs and an increasing difficulty in an efficient labour supply for farming, a more intensive agriculture is the need of the moment in Australia, and competition crops are definitely pointing the way to this desirable end.

AWARDS in Championship Competition.

Grower.	Variety.	Germination or Stand.	Cultivation Methods and Weed Control.	Evenness. Condition, &c.	Freedom from Insect Pests and Disease.	Purity and Trueness to Type.	Yield.	Total.
J. Simmons ... (Armidale.)	Wellingrove ...	9	22	8	9	13	33	94
W. Gilhome ... (Inverell.)	Fitzroy	10	22	9	9	11	24	85
Cooredella Estate ... (Tenterfield.)	Golden Glow ...	9	22	9	7	12	24	82

The Tenterfield Crops.

The Tenterfield district has not a great reputation for maize growing, although the area annually under crop runs about 4,000 acres. At firs

sight the district appears to be rather handicapped in comparison with other tableland districts by reason of its lighter soils, which are all of granitic origin, as compared with the stronger volcanic soils of other parts of the tableland.

Dairying is the main farming pursuit and the holdings are comparatively large (being mainly under natural pasture), while the cultivation areas are small. Maize growing is therefore a side line in the farm practice, but may be considered an important one where stock are kept, owing to the high feeding value of both the fodder and the grain.

Under these conditions it is possible for most land holders in the district to improve their lands by raising stock for some years, and to turn the increased fertility thus obtained to account by maize growing. In this way may be off-set some of the handicaps which are imposed by a light soil that does not stand continuous cropping for many years, as does the stronger basaltic soil in other tableland districts.

Up till January, the Tenterfield district was enjoying one of the best seasons it had experienced for many years. A rainfall of 4½ inches in August, followed by 6 inches in November, gave the crops a good start, and as this was followed by 3 inches in December and 4 inches in January, it is easy to imagine how well the crops appeared at the end of that month when they were first inspected. But with only about an inch in February, and not half an inch in March, combined with hot weather, the crops naturally went off, those on land which had been longest under cultivation being the first to show the ill effects.

The outstanding feature of the competition as it affects maize culture in the Tenterfield district is the demonstration that the industry can be lifted from the ruck of 20 or 25 bushel yields (about the average of the district in normal seasons) to 40 or 50 bushel crops, or even more, by utilising the stored fertility in pasture land for a few years and making new breaking from time to time.

Fertilisers have demonstrated their ability to still further increase the fertility of the soil and the yield of the crop on such land, and their use must be considered in the effort to secure the best and the most profitable crops of maize in the district.

One thing needs to be learnt by most farmers in this district in ploughing pasture land for cultivation—that is, in order to get rid of the couch grass quickly the land should be shallow ploughed in autumn or early winter, and the couch exposed to the frost, which quickly kills it. A deep ploughing is inadvisable as it merely serves to cover and protect the grass.

The first crop of the Cooredella Estate—which gained first place in the local competition with eighty-three points and thus earned the right to compete for the cups awarded by the Royal Agricultural Society for the Northern

District Championship—was grown on newly broken pasture which had been down for fifteen years. It was ploughed to a depth of 5 inches during the first week in August, was springtooth cultivated at the end of September, again shallow ploughed with a double-furrow mouldboard plough during the second week in November, and then harrowed and planted the first week in December. Fertiliser at the rate of ½ cwt. of superphosphate was applied with the seed. The variety used was Golden Glow, an early variety which was introduced to the district some few years ago by the Department of Agriculture and which is becoming popular because of its consistent yields.

The crop was twice cultivated and then hilled. There was a little couch grass here and there from the previous pasture, but it was fairly well under control and the crop was otherwise very clean. Germination was good, and the crop presented a very good appearance at tasselling and promised a high yield, but hot dry weather supervening in February and March cut it down to a 40-bushel yield.

The Inverell Crops.

The Inverell district grows its average annual crop of 15,000 acres (though the acreage is rather variable according to seasonal conditions during the planting months—September to December) chiefly on black, chocolate, or red basaltic soils. The black soils particularly are very fertile and are often naturally well supplied with lime and are therefore of a self-mulching nature and hold moisture well, more especially in flat situations. The warmer summer, combined with the lighter and less dependable rainfall, gives Inverell a handicap for maize growing in comparison with the more elevated tableland districts.

Inverell has a rather extensive form of agriculture, most of the farm land being under cultivation with wheat, oats, or maize, which latter is grown on comparatively large individual areas in a general, but not on a systematic rotation with the other crops. Although the soils by reason of their strong fertility can stand such a comparatively exhausting cropping system, the conservation of moisture by cultivation methods must needs play a large part in the success of the maize crop. But it is not generally recognised that early ploughing and the cultivation operations which precede planting of maize, are of greater importance in conserving moisture and making a successful crop than the cultivation during its growth—important though this also is.

As soil fertility constitutes the limiting factor in maize growing at Tenterfield, so moisture conservation represents the safe foundation on which good maize crops are built at Inverell. There is seldom sufficient rainfall during the growth of the crop in this district to keep the crop growing without those checks which are seriously reflected in the yield, and a greater endeavour is necessary to have a more abundant reserve of moisture in the soil at planting time to carry the crop better through these periods of shortage.

A rainfall of 3½ inches in May, 1925, should have made an earlier ploughing possible than August or September, when most of the competitors ploughed. Although 3 inches of rain fell in August, very little of this was conserved with late ploughing and drying winds. September and October were very dry and germination was difficult in early maize. A fall of 5½ inches in November brightened prospects temporarily, but no good rain fell thereafter, and the district went through one of the worst seasons for maize it has had in recent years.

The varieties grown in the competition plots were by no means representative of those grown in the district. Late varieties are only likely to be suited to rich black soils in flat situations, which are capable of holding moisture. Under other conditions it seems certain that farmers in this district will succeed better in maize growing generally, with early varieties distributed over successive plantings. In the competition plots under review, one missed entirely such good and proved varieties in this district as Funk's Yellow Dent, Iowa Silvermine, Kennedy, and Funk's 90-Day.

The first prize crop in the Inverell competition, scoring eighty-five points, was grown by Mr. Walter Gilhome of Gum Flat, on a rich black soil in a flat situation which had been under cultivation for forty years or more. It had just previously grown two maize crops and before that oats and wheat. It was ploughed 4 or 5 inches deep about the beginning of September, although it could have been ploughed earlier after the previous maize crop, and then probably deeper with advantage. The land was harrowed twice and planted about the end of October by hand in furrows opened with a single furrow plough 4 ft. 9 in. apart, and about 2 grains every 3 feet apart in the rows. Planting machinery is generally precluded on these black soils, which get very sticky if worked when wet, and skim ploughing the whole land or opening furrows for handplanting is generally resorted to. Usually hand planting after the plough is not carried out with sufficient care to get a uniform regular stand, but Mr. Gilhome's crop was exceptionally good in this regard. The variety grown was Fitzroy which is a late coastal variety, but which gives good results on rich moisture-holding flat soils in the Inverell district, though it would be a hazardous crop in other situations and on less fertile soils.

The crop was single-row scuffled once, and hilled slightly with a two-row cultivator. Being the third successive maize crop, the land was practically clean of black oats from the previous cereal crops, and except for a little water couch in places the crop was very clean. It lost a little in purity and trueness to type, a number of cobs showing an undesirable pale-coloured starchy grain. The yield was estimated at 40 bushels, and the crop must be regarded as an excellent tribute to the natural resources of the district in a season when most of the surrounding crops had failed and were being cut for cattle feed.

The Armidale Crops.

The Armidale district has an average annual area of 4,000 acres under maize, which is chiefly grown in rotation with wheat or oats (for hay or grain) and potatoes. The soils in this district vary greatly, often within a short distance from light granite to red, chocolate or black basaltic. The black basaltic soils in flat situations are generally the richest, but some very good free-working chocolate loams are not far behind from a maize-growing standpoint. On the very rich soils here, cultivation operations and weed control play the most important part in determining the yield of maize (apart from seasonal conditions), but the previous cropping and the immediately preceding crop are also factors which have their effect on the yield, particularly on other classes of soil. Other things being equal, potatoes are a better crop to precede maize than wheat or oats, particularly when they have been fertilised heavily.

Mr. John Simmons' Champion Crop.

Fertilisers are seldom used on maize in the Armidale district, farmers here falling into the usual error of thinking that their soils are sufficiently rich and do not require fertilisers. It has been abundantly proved that fertilisers are of benefit on soils twice as fertile as any soils in the Armidale district, and it has also been shown in this very district that a small quantity of fertiliser (particularly superphosphate) has the effect of providing a quickly available supply of plant-food to the young crop in the cool spring, which even the richest soil cannot provide at that time. The quick start thus given to the young maize plants is maintained throughout growth, and is generally reflected in the yield by several bushels per acre. Yet none of the competitors in the present competition applied fertiliser to their crop.

If the Armidale district is going to vie with the Inverell and other maize districts in yield, while they are more fortunate in seasonal conditions, it cannot afford to neglect this simple profitable means of adding to the yield of its maize crops.

The rainfall from about the preceding May is of interest and importance for maize growing in the Armidale district. Land that is ploughed about that time is ready to receive all the winter rainfall without run off, and from this time until spring there is little or no evaporation. In the season under review, the rainfall from May to August was light, being only about 7 inches, but with a practically rainless September and only an inch or so in October, those farmers who failed to conserve the winter rainfall by early ploughing found some difficulty in preparing a good seed-bed, and in getting a good germination and vigorous early growth.

A total of 4 inches in November was, however, very timely and carried the crops on well through December with another 2½ inches in that month. Although 5¼ inches fell in January, the bulk of it fell in one big storm and there was much run off on hill slopes, but maize in flat situations received the full benefit. After January, however, approximately 2 inches in February and 2½ inches in March were much below the average for these months, and being associated with comparatively high temperatures the light rainfall caused the crops to go off appreciably.

Probably in no other district in the State is the maize standardised as it is at Armidale. The three varieties included in the competition are practically the only varieties grown in the district. Gold Coin is an attempt to combine the deep grain of Large Goldmine with the earliness and hardiness of Wellingrove. When better fixed as to type, this should be an excellent variety.

The first prize crop in the Armidale competition, scoring ninety-four points was grown by Mr. John Simmons, Barley Hill, Armidale, on a black flat, a few miles from the town along the Dangarsleigh road. This land has been under cultivation for forty or fifty years and had previously grown two wheaten hay crops. It was ploughed in July 5 inches deep, and left to lie for a month open to the winter frost and rain. It was then harrowed twice, cultivated across, and again harrowed before planting, which took place about the end of September. The maize was sown with a double-row drill, in rows 3 ft. 6 in. apart and two or three grains every 28 inches apart in the rows—somewhat too thick a planting for the season. The variety was an improved type of Wellingrove, which was formerly known as Early Yellow Dent. The crop was kept very clean.

With an earlier ploughing after the preceding wheat crop, it is probable that in such a season more moisture would have been conserved, and the crop would have yielded more heavily than the estimate of 55 bushels per acre. Its general all round excellence, combined with its good yield, made it difficult to fault in the judging.

Diseases and Insect Pests.

Maize is a crop which is not generally reduced considerably in yield by diseases and insect pests, but both certainly do take their toll, and unless some precautionary or control measures are undertaken the damage may become sufficiently large to be disturbing.

The diseases in maize which are becoming increasingly evident in all parts of the State are the somewhat obscure root, stalk and grain rot diseases. No crop in the State is absolutely free from one or more of these diseases, and they are even making headway in the tableland districts where continuous maize growing is not the practice as it is on the coast. There is no cause yet for any great alarm amongst maize growers on account of these diseases, but it seems time that the attention of farmers was drawn to them and that some attempt was made by farmers generally for their greater control.

Though some of these diseases are accentuated where continuous maize growing is practised (as in coastal districts), the evidence that they are present and increasing on tableland crops where maize is only grown once in four or five years on the same land, emphasises the fact that these diseases are transmitted through the seed. The main difficulty in their better control by seed selection is that the diseases exist in several stages of severity, and that while it is comparatively easy to avoid stalks or ears which show the disease badly, in many cases where disease is contained in the seed there is little or no external evidence of the fact. In some cases there may just be a slight falling off in the plumpness of the grain. It is known that the type of grain bears some relation to the tendency to transmit some of these diseases—a soft starchy grain of pale colour and light weight being the type to be avoided on this account.

Evidence in the field in down or broken stalks, or a rotting of the shank supporting the ear, or premature ripening of the plant, is a sign of root or stalk rot disease generally attributed (with resignation) to the wind. These diseases, which may not be so visible in the ear when harvested, point to the need for greater attention to field selection of seed.

Some otherwise apparently sound ears show a stringy or shredded shank when the ear is removed, and these should always be looked on with suspicion, as inclined to cause a large amount of stalk rot or root rot in the following crop. Another type of injury due to this disease, which can be easily observed on the ears, is a peculiar splitting of the grain across the top or dent end. Ears showing the slightest trace of this should be wholly avoided, or the trouble will increase in amount and severity of injury.

In some of the crops inspected earworms were fairly abundant. These can be controlled to a greater extent by autumn or early winter ploughing, or even disc cultivation of maize stubble land, so as to break up the galleries of the pupating grubs and expose the pupæ for their destruction by the rigours of frost and by birds.

Farmers' Experiment Plots.

POTATO TRIALS, 1925.

Murrumbidgee Irrigation Areas (Griffith Centre).

E. B. FURBY, H.D.A., Agricultural Instructor.

AT no time has potato growing occupied the attention of settlers on these areas to any great extent, and perhaps, for many reasons, it never will, principally because the areas are not eminently suited for their production—a fact generally recognised by those who have endeavoured to grow them and have discontinued the practice. True it is that in the past some remarkably heavy crops of good potatoes have been grown here, but in the main these have been on particularly good land and under very favourable circumstances. On the general run of farms they are out of the question for commercial production, though on picked soils they can be grown successfully and profitably in a small way. The yields are not high as a rule, but the crop is usually harvested at a time when prices are high and thus can be disposed of locally at a very payable figure. The products from the trials that are the subject of this report brought up to 20s. per cwt. Careful attention to the preparation of the land, cultivation, and watering of the crop will largely determine the extent of the yield.

During the 1925 spring the following settlers co-operated with the Department in conducting trials:—

R. A. Smythe, Farm 1856, Lake View.
F. Spratt, Farm 1838, Lake View.

The season was not altogether a favourable one for potato growing. The weather was too changeable, and there was an almost entire absence of rain. No excessively hot weather was experienced, but very cold days and nights intervened between hot periods, and this is certainly not favourable to the production of good potatoes.

The effective rain after sowing was as follows:—August, 35 points; September, 46 points; October, 14 points. Total, 95 points.

The Plots.

Farm 1856.—A variety trial was conducted here on deep red loamy soil. The land was ploughed 7 inches deep early in the winter, cultivated once with the springtooth cultivator, and once with a disc cultivator just before sowing, and was then in good condition for planting. The sets, some of which were whole and some cut, and the eyes not well "shot," were dropped in 26th August 15 inches apart in every third plough furrow, at the rate

of 12 cwt. per acre, together with P 3 fertiliser mixture (10 parts superphosphate, 3 parts sulphate of potash, and 3 parts sulphate of ammonia), at 3 cwt. per acre. Germination was slow, though satisfactory. The crop was twice watered during the early growth, hilled twice, and cultivated twice, the latter being in the nature of additional hilling. Harvesting was done in December and early January with the following results:—

	tons	cwt.	qr.	lb.
Carman	3	9	2	26
Up-to-date	3	7	1	14
Early Manhattan	3	4	3	0
Factor...	2	16	2	0
Satisfaction	2	8	1	12

Carman and Early Manhattan were the two outstanding varieties. Every tuber of the former was of good marketable size, and the variety is very popular here on account of its good keeping qualities. With Early Manhattan and Factor there was only a small percentage of unmarketable tubers. Satisfaction and Up-to-date, on the other hand, were very disappointing, the great majority of tubers being small and scarcely fit for marketing. Up-to-date has failed previously with this grower for the same reason.

Of the varieties tried, Early Manhattan and Carman could be recommended to any grower.

Farm 1838.—A manurial trial with Early Manhattan was conducted on land somewhat similar to the variety trial, only it contained a greater percentage of coarse sand and was better drained—a very desirable feature for potato growing. In 1924 this area grew a crop of peas which were manured with superphosphate at 3 cwt. per acre, and a crop of maize in 1924–25, after which it was ploughed deeply and fallowed for six weeks. The sets were ploughed in, 15 inches apart, on 2nd September, 1925, some being cut and some whole. Three irrigations were given the crop at intervals of two weeks, the last being on 5th December, followed by a cultivation in each case.

The yields were as follows:—

	tons	cwt.	qr.	lb.
No manure	2	10	2	9
Superphosphate 2½ cwt. per acre ...	3	0	3	5
M13 mixture 3¼ cwt. per acre ...	3	6	2	10
P3 mixture 4 cwt. per acre	4	1	0	14

M13 mixture contains 10 parts superphosphate and 3 parts sulphate of potash. P3 contains 10 parts superphosphate, 3 parts sulphate of potash, and 3 parts sulphate of ammonia.

P3 mixture, or the complete fertiliser, has again given the highest yield, besides producing tubers all of which were of marketable size. No doubt the previous manuring of 3 cwt. of superphosphate per acre had some influence on the yields, but the results can be interpreted to show that manuring pays. The greatest percentage of unmarketable tubers was from the plot receiving superphosphate alone, where it reached 5 per cent.

Field Experiments with Wheat.

Bathurst Experiment Farm.

A SUMMARY OF FIVE YEARS' RESULTS.

R. THOMSON, Experimentalist.

Cereal variety trials have now been carried out at Bathurst Experiment Farm for a number of years, and a review of the results obtained during the past five seasons (1921–25) is worthy of notice, particularly with regard to the performance of several new varieties.

The area devoted to agriculture in the Bathurst district, although not very extensive, is made up of a large number of small mixed farms on which a considerable area is cropped for grain or hay every season. In addition numerous inquiries regarding varieties are received from the cool districts in the State, and a summary of the comparative yields obtained here should be of interest to farmers generally.

The farm soil is a granite loam, inclined to be gravelly, and overlying a clay subsoil. The average annual rainfall is 23 inches, the greater portion of which falls in the late autumn and during the winter. Good falls are generally recorded in the spring, and, while storms are often experienced about harvesting time, the summer is as a rule dry. Frosts may be expected from late March up till the end of October.

The trials comprise early and late sowings both for hay and for grain. The early plots are generally sown about the middle of April and the late ones about the third week in May. Very early sowings are not advisable in this district as the crops are liable to head out before the late frosts are past. Another advantage in favour of later sowing is the fact that many black oats and other weed seeds come away with the first rains, and delaying sowing slightly allows these to be caught and killed with a late skim ploughing or cultivation.

The usual farm practice is to sow wheat after a fodder crop. Algerian oats are sown during late February and provide grazing for the sheep from May onwards. The residue is ploughed in during October and the land receives a further skim ploughing in the early part of the autumn before the wheat is sown.

Harvesting for hay takes place towards the end of November. The grain crops are harvested about Christmas time with the reaper and binder, stooked, and later threshed. The summer, on the average, is too cool to permit the use of a header or a harvester within a reasonable time.

The following table gives the yields over a period of five years:—

Variety.	1921.	1922.	1923.	1924.	1925.	Average.
Hay (early sown).	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q. lb.
Cadia	1 8 2	1 15 3	1 13 2	2 19 0	1 15 0	1 17 1 11
Cargo	....	1 15 1	1 11 0	2 14 0	....	2 0 0 9
Cleveland ...	1 5 2	1 10 0	1 7 3	2 16 2	1 10 0	1 13 3 22
Warden ...	1 6 3	1 11 2	1 10 3	2 7 1	....	1 13 4 7
Roseworthy ...	....	1 8 3	1 4 1	2 2 1	....	1 11 3 0
Hay (late sown).						
Waratah ...	....	Too wet to sow.	....	3 4 1 8	1 13 2 15	2 9 3 26
Grosley ...	1 7 1 7		1 16 2 25	2 19 1 4	1 6 1 0	1 17 1 16
Carinda ...	....		2 1 1 3	3 8 2 3	....	2 14 3 17
Bathurst No. 7	....		2 1 0 14	2 19 2 22	1 6 0 7	2 2 1 5
Barwang ...	....		....	2 18 2 1	1 7 2 11	2 3 0 6
Grain (early sown)	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Cadia	....	23 40	21 46	26 48	19 57	23 3
Canimbla ...	20 12	23 13	20 53	34 26	23 24	24 25
Bena	....	....	....	32 30	19 5	25 47
Cleveland ...	19 54	18 33	17 36	26 46	18 32	20 16
Cudgen ...	18 18	22 53	18 38	29 14	18 15	21 27
Wandilla ...	....	22 36	17 44	30 14	22 16	23 12
Cargo	....	29 57	17 36	25 23	....	24 19
Comara ...	19 36	22 36	21 16	....	....	21 9
Grain (late sown).						
Waratah ...	....	36 52	28 32	39 6	28 12	33 10
Canberra ...	12 0	30 26	26 40	32 37	25 30	25 31
Grosley ...	11 36	29 6	16 40	30 7	24 7	22 17
Barwang ...	....	26 26	22 49	32 57	23 30	26 25
Hard Federation	9 18	28 54	26 25	30 31	22 50	23 36
Duri	....	....	....	34 26	27 36	31 1

Notes on Varieties.

Cadia (Cleveland x L.A.T.).—Good dual-purpose variety; earlier than Cleveland. Good stooler, medium-strong straw, not too flaggy, long white ear. Produces very attractive sample of grain.

Cargo (Cleveland x L.A.T.).—Very similar to Cadia but weak in the straw.

Canimbla (Cleveland x Hard Federation).—Good grain variety; medium-late ripening. Fair stooler, erect growth, little flag, strong straw, medium-long brown ear, plump grain.

Bena (Hard Federation x Marshall's No. 3).—Grain only; mid-season variety. Fair stooler, fairly strong straw, not a very tall grower, large brown ear, tip awns, large plump grain.

Cudgen (Cleveland x Gilgandra).—Grain variety; too late for district; ripens after Cleveland. Good stooler, very flaggy, long white ear, good plump grain.

Waratah (Early Purple Straw x Gluyas).—Excellent dual-purpose wheat; midseason to early variety. Good stooler, erect growth, strong straw, plump brown ear, long tip awns, bright plump grain.

Carinda (Cleveland x L.A.T. x Gilgandra).—Good hay wheat for late sowing. Fair stooler, medium-strong straw, medium-long white ear.

Bathurst No. 7 (Cleveland x L. A.T. x Gilgandra).—Hay variety. Good stooler, comes away quickly, fine stem and leaf, white ear.

Duri (Hurst's 14 x Canberra).—Grain variety. Very similar to Canberra; similar season, stronger straw, brown ear.

Of the above varieties Cadia, Bena, and Waratah have proved themselves suited to this district, while Canimbla and Duri are worthy of further trials.

INFECTIOUS DISEASES REPORTED IN MAY.

THE following outbreaks of the more important infectious diseases were reported during the month of May, 1926:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	6
Piroplasmosis (tick fever)...	Nil.
Swine Fever...	Nil.
Blackleg	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

STATE CONFERENCE OF THE AGRICULTURAL BUREAU.

THE fourth annual State conference of the Bureau will be held at Hawkesbury Agricultural College from 27th to 30th July, when an important business paper will be dealt with by delegates, and an interesting series of addresses will be delivered.

Several motions dealing with amendments in the constitution of the Bureau will be submitted, and among those approved by the Advisory Council are motions recommending an increase in the number of Bureau districts, and enlargement and altered composition of the Council.

Among the subjects upon which addresses have been invited are the following:—"Special Fallowing Systems," by Mr. E. S. Clayton, H.D.A., Senior Agricultural Instructor; "Producers and Consumers' Conference," by Mr. A. A. Watson, of the Lands Department; "The Essentials of all Co-operative Organisations," by Mr. Harper, chairman of directors of Westralian Farmers, Limited; "Development of Agricultural Organisation in Queensland," by Mr. H. H. Bentley; "Forestry and its relation to Agriculture," by Mr. J. J. McLeod, Senior Forester; "Horse Improvement," by Mr. M. L. Kingdon; "Power Farming," by Mr. H. Jeff. Bate; "Control of Noxious Weeds," by Mr. A. H. E. McDonald, Superintendent of Agriculture; "Pasture Improvement Work," by Mr. J. N. Whittet, H.D.A., Agrostologist; and "Supply of Water for Domestic and Stock Purposes," by Mr. W. Cattanach, Chairman of the Victorian Rivers and Water Supply Commission.

The conference will be opened by the Premier and Acting Minister for Agriculture, the Hon. J. T. Lang, M.L.A.

The Peanut.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor, and
G. NICHOLSON, H D.A., Experimentalist, Grafton Experiment Farm.

[Continued from page 462.]

Seed Selection.

THE value of seed selection for maintaining purity and evenness of type and as a means by which yields may be increased, is fully recognised by progressive maize and wheat growers. It is equally important that peanut seed be selected, and any extra time and labour expended in this direction will be amply repaid by increased yields, a greater uniformity in maturity, and superior quality nuts. Since the yield is influenced to a large degree by the character of the seed planted. it is essential that only seed obtained from a reliable source be used. Selections should be made only from the best sections of the previous year's crop. Plants that are true to type, producing a large number of well-developed nuts, containing mature, fully-developed kernels, free from disease, moulds or injury, should be chosen. It is not desirable that outsize nuts be retained for seed, as it is often found that the kernels are poorly developed. Greater satisfaction will be obtained if mature, medium-sized nuts are selected.

To carry out seed selection on a progressive basis, it is necessary that the work be done at harvest time, otherwise the type and yielding capacity ot the plant from which the seed was produced cannot be ascertained. A simple and effective system is to establish a small breeding plot, from which all supplies of seed may be drawn. In the first year high-yielding plants showing uniformity of type and other desirable characters are selected from the bulk crop and reserved for sowing a special breeding plot. The following year seed supplies will be drawn from this plot to plant the commercial areas. Each year the best yielding plants are reserved for planting the breeding plot. If this method of seed selection is adopted it will be possible to produce a high-yielding strain suitable to local conditions.

It is necessary to exercise special care to see that only properly cured seed be used for planting, since the vitality of the kernels is impaired if damaged by excessive moisture or heating during curing and storage. Those plants selected for seed supplies should be harvested on bright sunshiny days, carefully cured and stored in a dry, airy, well-ventilated barn, away from mice, rats or other vermin likely to cause damage. If only small quantities of seed are required, the peanuts may be picked from the vines and graded by hand. To obtain good results only graded, mature, undamaged, disease-free seed that has been efficiently cured, should be planted. The kernels should be allowed to remain in the pods until shortly before planting;

otherwise they are easily damaged, and rancidity develops, resulting in lowered vitality and poor germination. It is necessary to observe care in shelling, since any damage to the thin red skin or testa will affect the germination.

Preparation of the Seed for Planting.

Seed for planting may consist of—(*a*) unshelled nuts, (*b*) nuts broken in half, (*c*) shelled nuts (kernels). Of these three, the last is the most desirable, for although it is not essential to plant shelled seed, the contrary practice cannot be recommended for the following reasons :—

1. Planting whole peanuts will result in a slow and irregular germination, particularly if conditions are dry at seeding time. This will mean later maturity, which is undesirable.

2. With varieties such as Valencia, which contain three to four kernels, the seeding would be far too heavy.

3. Immature, diseased, damaged and poorly developed kernels cannot be discarded.

4. There is uncertainty of obtaining a good stand.

5. There is greater expenditure of seed.

If a planter is used for sowing, it is essential to use only shelled nuts.

In the case of the small-podded varieties, such as White Spanish, shelling is not so necessary, for if good seed is selected the pods will invariably be found to contain sound well-developed kernels. There is little danger of overcrowding, as this variety requires much thicker seeding than some of the later and more vigorous types. Sometimes pods containing only one kernel are graded out and reserved for sowing. Another method is to break in half the pods containing two kernels. This method is quick and effective, and has the advantage of saving considerable time, although it will not give results equal to the shelled seed. When unshelled nuts are used they may be soaked for a few hours previous to planting so as to encourage a more rapid germination, provided they are to be planted in a moist seed-bed. This practice must not be adopted when kernels are planted, as there is a danger of considerably damaging the seed. Shelling should be delayed until as late as possible before planting (two or three weeks), since less damage is likely to be done to the kernels and a better germination will be obtained. If reasonable care is taken in preparing the seed for planting there will be no difficulty in obtaining a good germination. Hand-shelled seed, although the operation is a somewhat slow and tedious one, is superior to machine-shelled seed. Machines have a tendency to damage or bruise the kernels, causing rotting in the ground of kernels otherwise sound.

Time to Plant.

The peanut is susceptible to frost both during the early and later stages of growth; hence the aim should be to plant and harvest during the frost-free period. Should frosts occur when the plants are nearing maturity the

peanuts will not suffer any material damage, apart from a tendency to become more easily detached from the vines, but the foliage will be destroyed, which is a point of importance if it is desired to make the tops into hay. The planting period is in the neighbourhood of that recommended for maize, but it is desirable to delay the operation until the soil has warmed up sufficiently to induce a rapid and vigorous germination. Planting in a cold soil generally results in rotting of some of the seeds, a slow and uneven germination and loss of vigour. For early-maturing varieties like White Spanish, planting may be continued for a few weeks later in the season, when it would be unsafe to plant late-maturing maize.

Provided a vigorous germination has been obtained, the moisture requirement of the late-maturing varieties during the first two or three months of growth is very limited, and they will withstand a considerable amount of dry weather, but a good supply of moisture is necessary when the plants are in full bloom and pegging strongly. As far as practicable, planting should be arranged accordingly, always keeping in view the fact that it is desirable to have a reasonably dry period during harvesting and curing. The main planting season will extend from October to December, although small plantings of White Spanish may be made during January in the upper North Coast districts. Since the plants make best growth during the early summer, mid-October to mid-November plantings will probably give the best results in most districts.

When large areas are to be planted to peanuts it is advisable to make two or three separate sowings so that the crops may be more easily dealt with at harvest time.

Methods of Planting.

The ordinary maize drill does not handle peanut kernels successfully, and much disappointment has been caused by attempting to plant peanuts with this machine using any of the usual plates. It is said, however, that special home-made wooden plates, with holes to fit the grade of seed to be sown, are quite satisfactory.

A good type of peanut planter is an attachment to the ordinary maize planter or similar special machine working on a cup system. These have been made and used successfully in New South Wales, and it is claimed that there is no possibility of the seed being injured in such machines, as there is when sowing with a plate drill. Planting by machine as compared with hand-planting is less laborious, quicker, and more economical; it gives an even sowing at a uniform depth and results in a quicker and more uniform germination, but until such time as there is sufficient demand for machines it will be necessary for the grower to plant by hand. The simplest method of hand planting is to draw shallow furrows with a light mouldboard plough; drop the seed along the furrow and cover with a single-horse cultivator with the back tine removed and a notched board fastened across the back so as to leave a slight ridge. One man and two boys can drill, drop and cover

1 acre of peanuts in a day. It is not necessary to completely fill in the furrow, for this can be done at the first cultivation and will help to smother any small weeds that have germinated in close proximity to the plants. Provided the land has been properly prepared and graded, and mature, undamaged seed is planted, no difficulty will be experienced in obtaining a good germination.

Rate of Seeding.

The quantity of seed required to plant an acre will vary considerably, according to the variety, distance apart of the rows, and distance between the seeds. Heavy seeding will give best results on the lighter types of soil, and particularly is this so with the early-maturing varieties that do not make a very heavy top growth. On the heavier and richer types of soil the growth will be much more vigorous; hence lighter seeding will be necessary to allow for full development of the plants. The most favoured distance apart for the rows is 36 inches, though this may be varied from 30 to 32 inches for small bunch types on light soils to 42 inches for runner types on richer soils. Rows should not be closer together than 30 inches, or they will not permit of efficient cultivation with a horse-drawn implement. When the plants on attaining their maximum growth have practically covered the intervening space between the rows the rate of seeding may be regarded as approximately correct. It is better to err on the side of thick seeding than of thin, for not only is there a greater prospect of obtaining a good yield, but weeds have less opportunity of making much growth if the stand is good.

PLANTING Distances and Amount of Seed required per acre for the Principal Varieties.

Variety.	Distance between Rows.	Distance between Plants.	Amount of Seed per Acre.	
			Unshelled.	Shelled.
	Inches.	Inches.	lb.	lb.
White Spanish, Red Spanish	30 to 36	6 to 8	40 to 45	30 to 35
White China	36 to 42	12 to 18	40 to 50	20 to 25
Valencia	36	9 to 12	30 to 40	20 to 25
Virginia Bunch	36	12	35 to 45	25 to 30
Virginia Runner	36 to 42	12 to 18	40 to 50	20 to 25

Cultivation of the Crop.

Special attention to the cultivation of the growing crop is of paramount importance if high yields of good quality nuts are to be obtained. Owing to the manner the peanut has of maturing its seed, the aim should be to keep the soil around the plant in a loose friable condition and free from weed growth during the flowering and pegging period, so as to avoid stunted development of the nuts. Heavy weed growth in the rows checks the entrance of the pegs into the soil and retards natural development of the nuts.

Summer grass is one of the most troublesome weeds the coastal peanut grower will have to contend with. Cultivation should be commenced shortly after the appearance of all the plants above the surface of the soil. On light sandy soils that have been carefully worked and are free from clods, trash, and other rubbish, the first cultivation may be carried out with a light set of lever harrows. Harrowing should be done across, not the same way as the rows are running. This form of cultivation may be carried out until the first pegs commence to set, when it must be discontinued owing to the danger of pulling them out of the soil. Harrowing is beneficial and will not damage the crop during the early stages of growth, provided trash is not allowed to collect around the tines. This work is best carried out during hot bright days, as the plants are more supple and damage from brittleness will be obviated. Harrowing is a quick and effective method of dealing with weed seedlings found growing between the plants in the rows, which are so difficult to eradicate with an ordinary cultivator. Clean cultivation from the commencement is the most effective and economical method to adopt, inasmuch that a large portion of the hoeing is eliminated. If the weeds once gain a hold in the rows they are difficult to deal with, since the plants must not be disturbed once the nuts have commenced to set. When it is no longer possible to use the harrows with safety, the cultivator is the best implement for further cultivations. This implement can be fitted with hillers and various sized tines and shovels, and these can be used according to the requirements of the crop. The aim with each cultivation should be to throw a small amount of soil around the plants, leaving a depression in the centre of the rows. Once the plants begin to peg, every care must be taken not to disturb the soil in their vicinity. Cultivation should be directed more to the middle of the rows, and the implement at the same time set so as to throw loose soil towards the plants. Further cultivation will probably be unnecessary, as the plants will have grown sufficiently to shade the soil. The number of cultivations will depend principally on seasonal conditions and the cleanness of the land. If care has been observed with the early cultivation, one hoeing will suffice.

The main objects in cultivation are to control weed growth, conserve moisture and maintain the surface soil around the plants in a loose friable condition so as to induce a large setting of nuts that will mature at approximately the same time.

(To be continued.)

THE economical working of a farm depends to a great extent upon it being well planned. It is not always possible to make a plan which will last for all time, but if a definite plan is made in the first place it will usually be found that any subsequent alterations will only be of a minor character.

Lamb-raising Trials.

Glen Innes Experiment Farm.

F. B. HINTON.

In view of the largely increased area in the New England districts now given over to mixed farming, and the excellent results obtained by mixed farmers in other parts of the State with fat lambs, it was considered that more data should be obtained regarding this class of sheep-farming in the district under review.

Fat Lamb Possibilities for New England.

Many practical sheep men in New England have considered the difficulties met with in that district too great to render lamb-raising profitable, and this, coupled with the distance from the main lamb-selling market, is a phase of the subject which requires consideration. Undoubtedly the long train journey from Glen Innes to Homebush is a serious factor to contend with when marketing sucker lambs, for sucker lambs waste rapidly immediately they are weaned. This factor must be considered by owners before marketing, and due regard must be paid to the weight of the lambs before trucking, so that they arrive at Homebush at a weight suitable for the drafts to receive the attention of the exporters. This means that lambs should weigh 33 lb. to 40 lb., dressed weight, or, broadly speaking, double that weight on the hoof.

As little information was available as to the most suitable breed or breeds for the production of lambs suitable for export in this district, it was decided to test those breeds which have been found to give good returns in other portions of the State, *i.e.*, Dorset Horn, Border Leicester, and, in addition, the Romney Marsh (which is found to give excellent results under unsound conditions), and the Lincoln, which has been greatly improved in its early maturing qualities of late years. The ewe flock consisted of 389 half-bred Romney Marsh ewes, of mixed ages, 4-6 and 8-tooth, and 91 comeback ewes. These were evenly divided into four flocks, and 120 ewes were mated with three rams of each of the breeds mentioned.

Some of the Troubles Met With.

The portion of the Glen Innes district in which the experiment farm is situated is not free from certain sheep diseases, the principal one of which is worms, and this item requires careful attention in the management of the flock.

During the period of the experiment under review, *i.e.*, from April, 1925, to March, 1926, it was found necessary, on account of symptoms of worm infestation, to drench the ewes four times and the lambs three times. Despite this careful attention, nine ewes in the flock of 480 died from the various worms. No lambs, however, were lost from this cause.

The drenches which were administered from time to time were the drenches recommended by the Stock Branch, viz. :—

1 oz.	White arsenic	or	4 oz.	Copper sulphate.
2 oz.	Sodium carbonate		4 oz.	Mustard.
3 gals.	Water		3 gals.	Water.
Dose	1 oz. per lamb		Dose	4 oz. per ewe.
Dose	2 oz. per ewe		Dose	2 oz. per lamb.

During the whole of the period the flock had access to the salt lick, which is recommended by the Stock Branch of the Department of Agriculture, viz. :—

Liverpool salt	30 parts
Bone meal	5 „
Sulphate of iron	1 „

During the latter portion of September and early in October, 1925, a cold snap occurred, and this was responsible for the deaths of a number of lambs before marking. These cold snaps are not altogether unknown in the New England district during these months, and losses due to these causes are to be expected. The experience raised the question whether the most suitable dates for mating had been selected in the course of this experiment, and it will come up for further investigation.

The reason for April being selected as the mating period was to endeavour to have the lambs born after the worst of the winter had passed, and also so that they would be growing at that period when the fodder crops and other activities of the farm would best suit. Despite careful shepherding, foxes extracted a toll prior to marking. The losses during the experiment from local conditions were as follows :—

Group.	By foxes.	By death before marking (mainly due to severe weather).
Lincoln	2	8
Border Leicester	1	8
Romney Marsh	0	13
Dorset Horn	2	12

The Drop of Lambs and their Growth.

Mating commenced on 21st April, 1925, the rams being removed on 15th June. It is as well to state here that it will be generally found better practice to limit the mating to six weeks rather than eight weeks, as it ensures that the lambs will be of more even drop when lambing is spread over the shorter period. During mating, each flock was yarded twice per week to ensure better service. Lambing commenced during the second week of September, with the results shown in the next table.

A certain amount of blow-fly trouble was experienced after marking, and the lambs lost condition for some little time. From the commencement of mating, right through the test, the four flocks were given equal treatment as

far as food was concerned, and as soon as the lambs were marked and distinguishing marks placed in their ears, the ewes and lambs were boxed, and were grazed on good crops of green oats and wheat.

Ram Group.	No. of Ewes.	Lambs Born.	No. of Twins.	Lambs Marked.	Percentage Marked.
			pairs.		
Lincoln	120	115	8	106	88
Border Leicester	120	107	7	97	81
Romney Marsh	120	112	11	99	83
Dorset Horn	120	122	3	107	88

During January it was found necessary to dip the whole of the flock on account of the presence of tick, and this had the effect on the lambs of somewhat steadying their growth for a short period after dipping. It is not suggested here that this is another trouble which will be generally experienced at the Glen Innes Farm, but dipping was rendered necessary on account of some purchased sheep proving unclean, with the result that the ewes and lambs were affected.

The lambs were marked at an average age of one month, and were then weighed, and at monthly intervals up to marketing. The following table shows the average weight of lambs in pounds at each monthly weighing :—

Date of Weighing.	Lincoln Group.		Border Leicester Group.		Romney Marsh Group.		Dorset Horn Group.	
	Wether. lb.	Ewe. lb.	Wether. lb.	Ewe. lb.	Wether. lb	Ewe. lb.	Wether. lb.	Ewe. lb.
20 Oct., 1925	23	22	24	23	24	20	20	20
16 Nov., „	36	34	37	30	34	33	40	39
15 Dec., „	54	50	53	50	54	47	57	57
12 Jan., 1926	65	58	58	60	61	55	70	68
9 Feb., „	67	71	68	65	67	64	80	77

Assistance was given, and ewes lost in lambing as follows :—

Group.	Deaths of Ewes due to Lambing.	Ewes Assisted at Lambing.
Lincoln	Nil.	8
Border Leicester	2	5
Romney Marsh	2	2
Dorset Horn	Nil.	2

In practically all cases, the need for assistance by the ewe at lambing was due to the large shoulders of the lamb, although a certain amount of difficulty was experienced in the Lincoln and Romney group, due to the size of the heads of the lambs.

The Monetary Results.

The lambs were marketed at Homebush in two drafts, the first draft being marketed when the average age of the lambs was five months, and the second draft a month later. When the lambs of the first draft were classed for marketing, it was found that more of the Dorset Horn lambs were ready for market than of those in the other groups. The following table shows the results obtained.

Group.	Lambs Marketed First Draft.	Price Obtained per Lamb.	Lambs Marketed Second Draft.	Price Obtained per Lamb.	Average Price for Both Lots.	Total No. Lambs Marketed.	Retained at Farm (too small to Market).	Nominal Price at Farm.
	No.	s. d.	No.	s. d.	s. d.	No.	No	s. d.
Lincoln	50	16 5	48	22 7	19 5	98	8	7 6
Border Leicester	50	17 10	46	22 3	19 11	96	1	7 6
Romney Marsh	50	15 10	43	20 7	18 0	93	6	7 6
Dorset Horn	60	18 1	44	23 4	20 3½	104	3	7 6

The next table shows the value per ewe mated obtained by selling the lambs, after taking into consideration the loss due to lambing troubles, but not taking into consideration losses due to worms and other troubles in each ewe flock :—

Group.	Ewes Mated.	Lambs Marketed.	Average Price per Lamb (including lambs retained at Farm).	No. Ewes Dead.	Value of Ewes.	Return Obtained per Ewe Mated (after deducting losses in ewes).*
	No.	No.	s. d.	No.	s. d.	s. d.
Lincoln	120	98	18 6½	Nil	...	16 4½
Border Leicester ...	120	96	19 9½	2	30 0	15 6
Romney Marsh	120	93	17 4½	2	30 0	13 10
Dorset Horn	120	104	19 11	Nil	...	17 9½

* No deductions have been made in these returns for freight or selling charges.

In connection with the marketing of the two drafts of lambs, it is pointed out that the first draft met the very low market ruling at Homebush during the month of February, consequent upon the very dry spell then being experienced throughout the State and the resultant heavy yardings of sheep, while the second draft, although lighter than the first, met a better market, owing to rain having fallen in the meantime. With regard to the first draft, the opinions expressed by buyers at the sales were that the lambs appeared to be a little dry (*i.e.*, lacking bloom), and some immature, and undoubtedly they showed the effects of their long journey.

Of the four crosses, the Dorset Horn cross looked the best, with the Border Leicester cross next. With regard to the second draft, it was impossible to form a fair opinion of the lambs at the markets, on account of the very heavy rain spoiling their appearance.

Conclusion.

During the course of the experiment an endeavour was made to ascertain the weight lost by lambs during transit, but circumstances out of the control of the Department prevented this, and it is hoped it will be possible next year to obtain data on this subject. The loss, however, must be considerable, as to land sheep at Homebush for Thursday's market it is necessary to place the sheep on trucks at Glen Innes on Monday night, and sucker lambs must greatly deteriorate in weight and appearance when separated from their mothers for three days and railed a journey of 423 miles before going in front of the buyers. The high cost of freight, and the selling charges must also be considered by growers. For the lambs which formed part of this test, the freight charges were 2s. 6½d. per head and selling charges 7½d. per head, which is a considerable item.

In order that growers might have a guide to the possible return from lamb-raising under New England conditions, the following table has been drawn up, showing the return which occurred with a crossbred flock of ewes under careful management. The results obtained in a previous table showed the return per ewe mated, after deducting losses due to lambing troubles, but the following table takes into consideration losses from all causes, freight, and selling charges. It should be pointed out, however, that the markets in which these lambs were sold were hardly normal—both being below the general ruling rates for lamb prices:—

Rams Used.	Ewes Mated.	No. of Ewes Died during Year.				Total Return from Lambs.			Less Value of Ewes died, 22s. and 30s each			Total Return obtained per Ewe Mated, after deducting Every Cost and loss of Ewes.	
		Worms	Lambing.	After Effects of Lambing.	Accidents, &c.	£	s.	d.	£	s.	d.	s.	d.
Various British Breeds.	480	9	4	3	6	387	1	1	354	1	1	12	2

It is not proposed at this stage to draw any conclusions, as it is intended that this test should be continued for a series of five years, but it is worthy of note that the Dorset Horn was the most profitable of the breeds used in the trials for 1925. The position occupied in the returns by the Lincoln should be very gratifying to those growers who have long maintained a good opinion of the Lincoln as a producer of fat lambs.

The Myth of the Co-operative Bus.

Co-operation brings success only when members jump out and push instead of climbing on to ride. There is no such thing as a co-operative bus that will enable farmers to ride to a place of high prices and profits. But there is a co-operative team work that will help hard-working farmers to accomplish their ends better, more easily, and with greater satisfaction to themselves. —Professor Macklin, University of Wisconsin.

Botulism in Cattle from Eating Rabbit Carcases.

H. R SEDDON, D.V.Sc., Director of Veterinary Research.

WHERE rabbits have been killed in large numbers, either by poisoning, trapping or fumigation, and their carcases left to rot, either singly or in heaps, it occurs at times that cattle and even sheep develop the habit of chewing and even eating the carcases. Of course such would probably occur also where only odd dead rabbits were present, but it is where there are numbers that this craving by stock for the partially decomposed carcases is likely to be noticed by the stockowner.

Occurrences of this nature have been observed in the past in the Gundagai district and at other places in the southern and south-western parts of the State, and recently a similar happening in cattle has been reported from the Hillston district. In this latter case there was a " dump " of rabbit carcases (twelve months old) and the owner stated that he had often seen his stock race from the yard straight to the dump and feed on these old carcases.

Though at times animals may exhibit no ill effects from consuming such a diet, it has frequently happened that sickness and death have followed. Where the rabbits had been poisoned (by means of phosphorus, &c.) the losses in the cattle were often in the past attributed to these animals having died from the effect of the poison that had been used for killing the rabbits. The symptoms in cattle, however, clearly indicated that such was not the case. As a result of earlier investigations it has been pointed out that the symptoms were obviously due to the swallowing of a bacterial toxin developed in the rabbit carcases, for no other type of toxin or poison would cause the peculiar symptoms set up in these animals. At the same time definite proof that such was the cause has hitherto been lacking, for neither the toxin nor the microbe which produces it had been actually found in such carcases. This is not altogether surprising when we realise that we are dealing with a microscopic agent in the bacterium and with a toxin which is so powerful that when dried (as it would be in such carcases) it might consist of only a few grains of dust. Furthermore, as will be seen later, it is possible that only a percentage of carcases are harmful. From rabbit carcases sent from Hillston, however, it has been possible to cultivate this bacterium and to identify it. It has been found, as was suspected, to be a type of *Bacillus botulinus*.

How Rabbit Carcases Become Toxic.

Bacillus botulinus occurs in the soil in different parts of the State and may, therefore, get into the stomach or intestines of animals along with their food. Under such circumstances, peculiarly enough, it does no harm;

When any animal dies, however, the microbes in the intestine invade all parts of the carcases, causing what is commonly termed putrefaction, and if, therefore, *Bacillus botulinus* be present in the intestine it likewise flourishes in such a carcase and produces its toxin therein. From this it follows that the toxin may be produced in the carcase of any animal, whether it be ox, sheep or rabbit, the sole requirement being the presence of *B. botulinus* in the soil upon which the animal has been running. There is thus a grave danger of carrion containing the toxin and thereby being most harmful to stock.

Why Animals Chew Rabbit Carcases.

When animals chew rabbit carcases or bones of any animal it is in an endeavour to supply a deficiency in their diet, and that substance is phosphorus. Unfortunately the soil in many parts of Australia is seriously deficient in phosphorus, with the result that the vegetation growing upon it is also deficient. As animals require large quantities of phosphorus for the development of their bones and in the secretion of milk, such a deficiency becomes a very important matter. (This aspect of the question was dealt with at length by Mr. Max Henry, Chief Veterinary Surgeon, in the *Agricultural Gazette* for December, 1925.)

Bone-chewing or carrion-feeding therefore spells a deficiency in the diet, and it follows that were it not for this abnormal craving the animals would not contract the disease brought about by eating such bones or carcases.

Prevention of the Disease.

From the above it will be seen that for the disease to occur we require, firstly, the presence of the microbe in the soil, and, secondly, a deficiency of phosphorus in the soil, the disease being the result of circumstances brought about by these two factors as indicated below.

Microbe in soil.	Deficiency of phosphorus in soil.
↓	↓
Decomposing carcase.	Deficiency of phosphorus in vegetation.
↓	↓
Toxic carrion.	Depraved appetite in animal.

Botulism in animal.

How can one control the disease? The harmful microbe cannot be removed from the soil, but the amount of toxic carrion can be very materially reduced by the destruction of carcases by fire. This is not always possible, but much more might be done in this direction. Even apart from this, small carcases, such as those of rabbits, could be rendered inaccessible to stock until it is safe to burn them.

The deficiency of phosphorus in the soil can in many cases be remedied by the application of phosphatic manures, but even where areas are too large or the expense would not be justified the deficiency of phosphorus

the *diet* can be made gooa by the provision of bonemeal licks. Such must, however, be sufficient in quantity and readily accessible to animals at all times.

In summary, therefore, the cycle required to bring about this disease may be broken by any one of the following :—

1. Destruction of carrion.
2. Supply of phosphatic manures to soil.
3. Provision of bonemeal licks.

Of these the provision of bonemeal licks and the destruction of carrion should be within the compass of most stockowners.

Every Maize Grower Needs This.

The close relation of the question of variety to profitable maize growing, and the attention that has lately been devoted to the improvement of varieties, should ensure the Department's recent bulletin on this subject a ready demand among farmers interested in this crop. Farmers' Bulletin No. 152 describes and classifies locally grown varieties according to type and maturity, and illustrates the greater proportion in blocks which are a feature of the publication. The bulletin comprises eighty-seven pages of matter on high-class paper, and is obtainable from the Government Printer, or from the Under Secretary, Department of Agriculture, Sydney, for 1s. 2d., post free.

Tubercle-free Herds.

The following herds of cattle have been submitted to the tuberculin test by Government Veterinary Officers or approved veterinary surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd :—

Owner	Address	Breed.	Number tested.	Expiry date of this certification.
Department of Education ...	Eastwood Home	......	10	7 Oct., 1926.
Do do ...	Hurlstone Agricultural High School.	......	47	23 Nov., 1926.
Do do ..	May Villa Homes ...	......	6	8 Jan., 1927.
Do do ...	Yanco Agricultural High School.	......	29	14 Jan., 1927.
W. Burke	Bellefaire Stud Farm, Appin	Jersey	31	19 March, 1927.
Department of Education ...	Gosford Farm Home	......	32	16 April, 1927.
H. W. Burton Bradley ...	Moorland	Jersey Stud.	71	21 May, 1927.

—Max Henry, Chief Veterinary Surgeon.

Dentition and the Age of Sheep.

Experiments at Trangie Experiment Farm, 1922–25.

F. B. HINTON.

One of the most discussed questions among sheepmen is that of the age of the sheep, and it is difficult to find any two authorities who agree on the question.

The sheep has altogether thirty-two teeth, viz., eight incisors in the lower front jaw, and twenty-four molars, the latter being divided into six on both sides of the upper and lower jaw. As is known to every sheepman, sheep have no teeth in the front part of the upper jaw, but the incisors of the lower jaw meet a dense fibrous pad.

The newly-born lamb usually has no teeth. The first ones appear generally a week after birth, and by the time the lamb is two months old the milk teeth are all in place.

As the teeth are used by sheepmen as the main indication of age of sheep, the matter assumes a certain importance, and in consequence, a test was carried out at Trangie Experiment Farm with nine Merino ewes to determine whether any variation occurred in such a small number.

Youatt, the well-known authority on sheep, in his book, "Sheep, their Breeds, Management, and Diseases," gives it as his opinion that a newly-born lamb has no incisor teeth, or at the most two, but that under a month it has eight milk teeth. He further states that the two permanent incisors appear at fourteen to sixteen months old, the next two are well grown at three years old, the next two, *i.e.*, six permanent incisors, are well grown at four years, and the eight permanent incisors are fully exposed at five years.

Hawkesworth, in his "Australian Sheep and Wool," states that a lamb is born without any or with one incisor tooth, and before it reaches the age of one month it has eight. Two permanent incisors show between ten and twelve months, four permanent incisors between twenty-four and thirty months, six at forty-two months, and the mouth is full when the sheep is five years old.

John Wrightson, M.R.A.C., F.C.S., in "Sheep, Breeds and Management," states that a sheep is a two-tooth at fourteen months, a four-tooth at two years, a six-tooth at three years, and full mouth at four years, while at five years the teeth tend to widen, and the corner ones are lost.

In Butterworth & Co.'s book on "Management and Diseases of Sheep in Australia" it is stated that a newly-born lamb has two to four teeth at birth, and the full eight are present at three weeks. Two teeth appear at

fifteen months, four teeth at two years, six teeth at three years, full mouth at four years, while at six years the centre teeth are usually broken.

These quotations from the above authorities show a wide discrepancy, and the attached table, showing the results of the test carried out by this Department, will prove interesting, as it varies with all the authorities quoted.

With regard to the milk teeth of the sheep under test, two were born with two milk teeth, and all had their milk teeth up at eight weeks, although eight of them had their milk teeth up at five weeks.

The diagram on the opposite page shows the formation of the incisors with the names by which they are generally known.

TEETHING Experiment at Trangie Experiment Farm, 1922-25.

Tattoo No. of Sheep.	2	5	8	13	50	52	54	55	210
	Teeth.	Teeth.	Teeth.	Teeth.	Teeth.	Teeth.	Teeth.	Teeth.	Teeth.
1 week	None	None	2 broken	2	None	None	None	None	None
8 weeks	8	8	8	8	8	8	8	8	8
15 months	No change.	No change.	1 C. showing.	No. change.	M. worn.	No change.	No change.	No change.	M. worn.
16 ,,	No change.	M. worn.	2 C. up	No change.	1 C. up, 1 C. showing.	No change.	No change.	No change.	2 C. showing.
17 ,,	M. opening.	Centres broken.	2 C. ...	1 C. up	2 C. ...	Centres. broken.	M. opening.	2 C. up	1 C. up, 1 C. showing.
18 ,,	2 M. broken.	2 C. ...	2 C. ...	2 C. ...	2 C. ...	2 C. ...	2 C. ½ up	2 C. ...	2 C.
19 ,,	2 C. ½ up	2 C. ...	2 C, 2 M. showing.	2 C. ...	2 C. ...	2 C. ...	2 C. ¾ up	2 C....	2 C.
20 ,,	2 C. ...	2 C. ...	2 C., 2 M. ½ up.	2 C. ...	2 C., 2 M. ½ up.	2 C. ...	2 C....	2 C. ...	2 C.
21 ,,	2 C., 2 M. ½ up.	2 C. ...	2 C., 2 M.	2 C., 2 M. ½ up.	2 C., 2 M. ¾ up.	2 C... M. ¼ up.	2 C., 2 M. ½ up.	2 C. ...	2 C.
22 ,,	No change.	2 C., 1 M. showing.	4 up ...	No change	2 C., 2 [illegible]	2 C., 2 M. ¾ up.	No change.	2 C., 2 M. showing.	2 C., 2 M. showing.
23 ,,	2 C., 2 M. ½ up.	2 C., 2 M. ¾ up.	4	2 C., 2 M. ¾ up.	4	2 C., 2 M.	2 C., 2 M.	2 C., 2 M. ½ up.	2 C., 2 M. ½ up.
24 ,,	2 C., 2 M.	2 C., 2 M. ¾ up.	4	2 C., 2 M.	4	4	4	2 C., 2 M. ¾ up.	2 C., 2 M. ¾ up.
25 ,,	4	2 C., 2 M.	4	4	4	4	4	No change.	No change.
27 ,,	4		4	4, 2 L. broken.	4	4	4	4, 2 L. broken.	4 up.
28 ,,	4		4, 2 L. ½ up.	4, 2 L. ½ up.	4, 2 L. ½ up.	4	4	4, 2 L. ½ up.	4
29 ,,	4, 2 L. ½ up.		4, 2 L. ¾ up.	4, 2 L. ¾ up.	4, 2 L. ½ up.	4, 2 L. broken.	4, 2 L. ½ up.	4, 2 L. ½ up.	4, 2 L. broken
30 ,,	No change.	Died.	No change.	No change.	4, 2 L. ¾ up.	4, 2 L. ½ up.	No change.	No change.	4, 2 L. ½ up.
31 ,,	4, 2 L. ¾ up.		6 up ...	6 up ...	6 up ...	4, 2 L. ¾ up.	4, 2 L. ¾ up.	4, 2 L. ¾ up.	4, 2 L. ½ up.
32 ,,	6 up ...		6	6	6	No change.	No change.	No change.	No change.
33 ,,	6		6	6	6	6	6 up ...	6 up ...	6 up.
34 ,,	6, 2 C. broken.		6, 2 C. broken.	6, 2 C. broken.	6, 2 C. broken.	6	6, 2 C. broken.	6, 2 C. broken.	6
35 ,,	6, 2 C. ½ up.		6, 2 C. ½ up.	6, 2 C. ½ up.	6, 2 C. ½ up.	6, 2 C. broken.	6, 2 C. ½ up.	6, 2 C. ½ up.	6
36 ,,	6, 2 C. ¾ up.		6, 2 C. ¾ up.	6, 2 C. ¾ up.	6, 2 C. ¾ up.	6, 2 C. ½ up.	6, 2 C. ½ up.	6, 2 C. ¾ up.	6, 2 C. broken.
37 ,,	Full ...		Full ...	Full ...	Full ...	Full ...	Full ...	Full ...	6, 2 C. ½ up.
38	Full ...		Full ...	Full ...	Full ...	Full ...	Full ...	Full ...	Full.

The lambs were all born during the week ending 24th March, 1922.
C. refers to Central Incisors up to 25 months, and from 34 months onwards to Corner Incisors.
M. Refers to Middle Incisors. L. Refers to Lateral Incisors.

Summary.

It is pointed out that the wide variation which is demonstrated above occurred in nine sheep only, and it is possible that a greater range of variation would occur in larger numbers. From the table it can be stated that the test sheep reached the two-tooth stage in a period covering nineteen months. They also reached the four-tooth stage between the age of twenty-one months and twenty-five months. Further, they reached the six-tooth stage between the age of thirty months and thirty-two months, and were full mouthed, or had eight incisors fully up, at thirty-eight months.

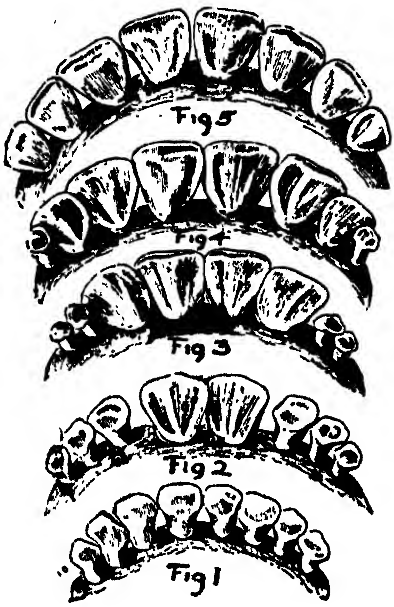


Fig. 5.—"Eight-tooth" { 2 central incisors. 2 middle ,, 2 lateral ,, 2 corner ,,

Fig. 4.—"Six-tooth"... { 2 central incisors. 2 middle ,, 2 lateral ,, 2 milk teeth.

Fig. 3.—"Four-tooth" { 2 central incisors. 2 middle ,, 4 milk teeth.

Fig. 2.—"Two-tooth".. { 2 central incisors. 6 milk teeth.

Fig. 1.—Lamb's teeth ... 8 milk teeth.

No mention has been made of the change which took place in the molars, nor were any records kept in this connection, because it is rarely, if ever, that the molars are consulted when determining age.

Another point which is inclined to complicate the question of age determination by teeth is the variation in soils and herbage, which occurs throughout the State, and it is well known that different types of soils have a varying effect upon the teeth of sheep.

PASTURING is no doubt the easiest method of feeding a dairy herd, but it is within the mark to say that there is hardly a single district in the State where that can be done all the year round. It is just here that the silo comes in, for it is an undoubted insurance of a continuity of good food, and consequently of a regular milk supply, and it also makes it possible to carry on operations on a smaller area, and therefore at lower rental charges.

Dairy Farm Instruction.

IMPROVING CREAM QUALITY.

No. 3.—Tweed-Richmond Rivers District.

L. T. MACINNES, Dairy Expert; H. D. BARLOW, Senior Dairy Instructor; and A. L. ASTBURY and I. W. SCOTT, Assistant Dairy Instructors.

THE Tweed and Richmond Rivers district is situated in the extreme north-east part (coastal) of New South Wales. In area it is not so large as some of the other districts in charge of Senior Dairy Instructors, but in the output of its factories it exceeds them, and is, therefore, looked upon as the most important dairying centre in the State. Eight companies manufacture butter in twenty-four factories, in an area about 60 miles long averaging 30 miles in breadth; there is also one condensed milk factory. For the year ended 30th June, 1925, these butter factories had an output of 43,734,510 lb. The total output of all factories in the State was 112,102,902 lb. It will, therefore, be seen that this small north-east corner produced 39 per cent. of that total.

Owing principally to the prevailing practice of daily deliveries to the factories during the summer months, the cream quality is uniformly of a higher standard than that found elsewhere, and this is reflected in the quality of the butter, the classification of which showed that for the year 1924–25 some 90 per cent. reached choicest grade, as compared with 82 per cent. choicest attained for all factory butter produced in the State for the same period.

In this district there is a greater amount of standardised manufacturing effort than is to be found elsewhere in Australia. Such concentration of control has a material and beneficial effect on production, both on the farm and in the factory. It would be better if this group control system was carried out even more extensively, both from the economic and quality uplift view points. Centralising control in manufacture enables the official dairy instructor to carry out his duties with greater effectiveness, and aids him to achieve better results in his efforts to (*a*) increase production and (*b*) improve the quality of the raw and manufactured products.

The Tweed-Richmond area is officially supervised by a Senior Dairy Instructor in charge, two Assistant Dairy Instructors, a Herd Testing Organiser, and eleven Herd Testers. Of this staff only the three Dairy Instructors are available to give instruction in the care of milk and cream on the farms. The demands on their services—especially in the humid tropical summer months, when milk and cream are so subject to rapid deterioration—are heavy, and here, as elsewhere in the State, additions to the Department's instructional force are urgently necessary.

During the last twelve months 700 farms supplying inferior cream in the Tweed-Richmond district have been visited, and it is pleasing to state that, although the advice has apparently not always been carried out, and probably, in isolated cases, not been taken seriously, in the majority of cases (80 to 90 per cent.) a marked permanent improvement could be noted in the quality of the cream after the instructors' visits. One point that is brought home to factory suppliers is that the men supplying inferior cream are practically taking money out of the pockets of the whole of the suppliers, since all inferior cream must have its effect either on butter quality or market conditions. Even if this inferior cream be classed first or second grade, the deduction made by the factory is not always adequate to cover the loss incurred by the extra time and labour which are necessary when this cream has to be treated separately. One finds in the majority of cases that the cause of low grade cream is general carelessness in the washing and scalding of dairy utensils (usually exemplified by a quick cold water wash at night), by leaving the skim-milk cask alongside the dairy, failure to remove manure from yards or surroundings and untidy conditions generally. Probably 90 per cent. of inferior cream is due to the above causes; the other 10 per cent. is associated with the lack of care for the cream once it is separated, together with seasonal conditions and factors such as bad water, food taints, &c. With regard to food flavours, this district is particularly well off, as, generally speaking, the pastures are very free from objectionable weeds, &c.

During the months of December, January, February and March, owing to the moist humid conditions which characterise the district, bacterial development is so rapid that to supply choicest quality cream great care is essential, and the farmer's best insurance against an inferior quality is the rapid cooling of his cream during or immediately after separating to below the optimum point for undesirable bacterial development, i.e., to about 70 deg. Fah. if possible, and the daily delivery of all cream to the factory for manufacture into butter.

In a climate such as we have to contend with, temperature plays such an important part in cream condition that every degree the temperature of the cream can be lowered is an advantage. In this connection must be emphasised the use of the cream cooler, and the provision of a cream storage room, large enough, and so ventilated that as low a temperature as possible will be maintained during the day time. Many of the dairies in use fall far short of the ideal, being no more than boxes, and showing (in extreme cases) a temperature inside as high as 115 deg. Fah. on a hot day. This temperature maintained for any time would of necessity cause the cream to deteriorate rapidly.

A large number of "yeasty," "fermented" and other creams with bad absorbed odours have been traced to contamination from insanitary pigsties, dirty dairy buildings and surroundings, and skim-milk flumings and skim-milk casks outside the buildings, which are as often as not in an

insanitary condition. Wooden casks cannot be too strongly condemned for storage of skim-milk; they should be replaced by galvanised iron tanks on a cement floor, as these are more easily and efficiently cleaned after each separation. Under conditions where gravity can be utilised, wide open fluming to carry the milk to the pig pens is much the better method—these of course, to be always kept clean.

Many farmers fail to understand what constitutes boiling water—as long as it is " pretty hot " they consider it will do, not worrying that its temperature is frequently too low to give it germ-killing efficiency. Often, too, there is an inadequate supply of boiling water, due mainly to only one benzine tin of water being prepared, which is part mixed with cold water for washing purposes, the balance being used for sterilising and drying. There is also inadequate provision made for boiling the water. It is strongly recommended where conditions will allow that a set-in copper or, better still, a chip heater be installed with direct water supply from a tank attached to the dairy. Numerous farmers consider one such tank provides an adequate supply for dairy purposes all the year round, and make no further provision against dry spells. When these come they cart water from creeks and waterholes, often only a few hundred yards distant, whereas frequently, with the expenditure of a few pounds for a pump or windmill, ample good fresh water could be obtained for all purposes from such permanent sources as wells and running streams. Good quality water is one of the first essentials in the production of a choicest grade milk or cream. The dairy tank should be well protected against the invasion of frogs, birds, &c.

The farmer, forgetting that milk and its products are most perishable things to handle, too often leaves the washing of utensils and the care of cream in the hands of children or employees, over whose operations the farmer exercises little or no effective control. Supplied with the separator is either a tin tube or galvanised iron wire to keep the separator disc together. This leads to only a general swilling of the discs in the water and not the separate careful washing of each part. The result is that the discs are generally left in a greasy unhygienic state. To ensure thorough cleaning they should be washed separately and scalded after each separation, and aired in a dry clean place.

Numerous cases of second grade cream arise from the use of milking machines, and are due in many cases to infection from the vacuum line where the old style of plant is in use—those that have a large vacuum tank and line, which are very hard to dismantle and clean, and more often than not are not cleaned at all. Under such conditions, farmers are advised to instal the latest type vacuum line and tank. The rubber inflations and tubes, owing to their high price, cause the farmer to use them as long as possible, and this fact is responsible for most other machine trouble. Only when he is shown how the rubbers affect the quality does he see the necessity for replacing them more frequently.

The instructor, on visiting the farm, explains his mission and asks for, and in practically every instance receives, the farmer's co-operation. Demonstrating with the means to hand, he explains how milk and cream can be deteriorated by the hands of the milker, udder and teats of cows, manure, utensils, and general surroundings, and also when waiting delivery to the factory. In illustrating these points, and tracing the cause of low grade cream, the use of the local and headquarters biological laboratories is proving of inestimable value. Invariably instruction to the farmer is given with the aid of bacterial plates to show the infection, e.g., from a clean dairy and an insanitary dairy, or in a second class cream and a choice cream. Thus the farmer is more readily able to grasp the significance of bacteria as allied to the keeping quality of cream, and when the instructor explains to him their size, life and development, he readily sees the necessity for clean milk production and the immediate cooling of the cream below optimum point for undesirable bacterial development.

Two Examples of the Benefits of Instruction.

Two cases may be cited as illustrating the lines upon which instruction is given and the benefit derived :—

On farm A (visited on 25th May, 1925) the cream had a distinct machine taint. On examination the milking machines showed evidence of lack of proper care; the milk line was dirty, the rubber milk inflations soft and sticky, and the rubber milk tubes, &c., contained a yellowish slime. All the rubbers were kept in plain water during the day (thus supplying ample moisture for growth of bacteria contained in the slime). The instructor assisted in the dismantling and thorough cleaning up of the whole plant, and advised the purchase of new rubbers, &c. Interviewed some eight months later, this supplier said he had not had a can of second grade cream since the instructor's visit, and that the trouble was that he had been working on the wrong lines. He admitted that in his case second grade cream was due to ignorance, partly assisted by wrong impressions with regard to cleaning given by the agent who installed the plant.

At farm B (visited 2nd December, 1924) the supplier had been having 95 per cent. of his cream graded second grade. On arrival at the dairy the instructor found everything in fair order, excepting the yard. To show that thorough care in washing and scalding of the utensils and the care of the cream would be beneficial, the instructor himself did the work of washing and scalding, and looking after the cream. Before the afternoon's milking the bails and dairy were washed down, the yard cleaned, and all utensils re-washed and thoroughly scalded. During the milking the cows' udders were washed with water containing a solution of Condy's crystals; the udders dried, the hands of the milkers cleaned, the water used being changed frequently. As no cooler was available, an improvised cooler and aerator were used. A clean jam tin was taken for the purpose, six holes (an equal

distance apart, each hole $\frac{1}{8}$ inch in diameter) being punched in the bottom of tin. The cream was allowed to run into this and drop as far as possible to the cream container, and afterwards poured from one vessel to another; each skimming was mixed as soon as of equal temperature, and stirred as often as possible.

This dairyman, with a properly constructed hygienic cooler, has carried on in the same lines, and a report from the factory manager dated fourteen months after the instruction was given says that the farmer has had less than one per cent. of his cream graded under choicest quality.

Generally speaking, by far the worst cream received at the factories on the Tweed and Richmond Rivers comes from farms where milking machines are in use, and this seems to be due to want of knowledge, lack of proper care of such machines, and to inappreciation of the fact that the bacteria associated with milking machines are of a very virulent and active type, which on entry to the milk during its passage through the machines are in an actively growing state (particularly where rubbers are kept in plain water); under ordinary hand milking conditions these particular bacteria would take twelve or more hours to reach a development that two or three hours would produce in machine cream.

The Desirable Conditions.

It is our opinion that the percentage of second grade cream on the Tweed and Richmond Rivers would be reduced to a negligible quantity provided the following conditions could be fulfilled:—

1. The general provision of overhead water supply by means of tanks, windmills and pumps.

2. The general provision of ample facilities for boiling water, such as a set-in copper or chip heater connected with the general water supply.

3. General use—first, of cold water; second, of warm water and washing soda for first washing; third, of boiling water for proper scalding; finally, drying of all dairy tinware and the cleaning of the milking plant.

4. More general knowledge of milking plants, especially in regard to their cleaning and handling.

5. The general adoption of the cooling of cream to as low a temperature as possible; keeping it in cool, clean, well-ventilated surroundings, stirring frequently and mixing when cool.

6. Daily delivery of all cream from farm to factory.

THE main essentials in the profitable rearing of pigs are (1) early maturity, (2) animals with good fattening properties, and (3) large healthy litters; and these necessitate (*a*) good stock, (*b*) good housing and living conditions, (*c*) correct feeding, and (*d*) careful breeding and treatment of the young.

Milking Machines in the Tumut District.

E. O. DALGLEISH, H.D.D., Senior Dairy Instructor.

THERE are more milking machines in use in the Tumut district than in any other inland district, or, indeed, than in most coastal districts. The machines, mostly of the "releaser" type, range in size from large plants milking up to 170 cows down to the small two-cow plants milking twenty or thirty. Almost every herd of any size is milked by machines.

It must be recognised that machine milking in the dairying industry has come to stay. Many farmers could not possibly carry on without it, but it must also be admitted that so far machine-milked cream is almost always inferior to the hand-milked article. The observations of the writer during the past few years may therefore be of some value to dairymen at Tumut, and also in other parts, as to the causes of a great deal of the inferior quality, and the best means of remedying it.

Washing-up.

It is almost unnecessary to state that the first and greatest cause of inferior quality is poor methods of washing the machines, and here let it be said that the farmer who instals machines without first making sure of a plentiful and good water supply is only looking for trouble. Plenty of water is absolutely essential if washing-up is to be done thoroughly, for the machines require easily four or five times the quantity of water that is necessary when cows are milked by hand.

A matter that is religiously left alone by machinery agents when selling a farmer a milking plant is the time necessary to wash the machines properly. A great deal of capital is made of the fact that machines will reduce the time of milking by half, but no mention is made of the other fact that they double the time spent in cleaning. Herein lies the secret of much of the trouble found to-day. Farmers instal machines primarily to reduce the time spent in the bails, and cannot realise that when milking is over some of the time saved by the machines must be spent in caring for them properly. Yet if a proper system is evolved and the same routine is gone through every day, the thorough cleansing every day becomes almost second nature, and is treated as a matter of course.

Cases have actually been found at Tumut where machinery agents, in their anxiety to sell their goods to a farmer, have advised him to only pull his plant to pieces every six or eight weeks. The condition of a six-cow plant milking 100 or 120 cows after eight weeks can be imagined. Yet in such cases the farmer is inclined to regard the agent who sold the machine as "the man who knows." The fact that his cream is invariably second grade is only to him a proof that the factory "has a set on him." Such unscrupulous, or perhaps ignorant methods by selling agents cannot be too

strongly condemned. If an agent cannot sell his machine on its merits, then it would be far better for the dairying industry if he did not sell it at all. Misrepresenting facts to the farmers and misleading them in the manner stated has done much harm, and has led to many plants being thrown out.

The detailed method of cleaning machines has already been dealt with in an article on "The Care of Milking Machines," by Mr. O. C. Ballhausen, Assistant Dairy Expert, and farmers would be well advised to carry out in detail the instructions given there. Copies of the article are obtainab'e in leaflet form on application to the Under Secretary, Department of Agriculture.

Care of Rubber Parts.

It is only too evident that most farmers know very little of the proper care of the rubber parts of machines. As a rule, any metal parts are fairly well looked after. The farmer likes to keep the milk line "like a gun barrel." He will give the vacuum line, vacuum tank, releaser, &c., reasonable attention, but usually where he fails is in looking after the rubbers. These rubbers are the vital parts of the machine as far as the quality of cream goes, and any neglect there is instantly reflected in the cream. Further, when we remember that a new set of rubbers for a plant may cost up to £10 or more, it should be realised that it pays to look after them, otherwise machine-milking can easily be made more expensive than hand milking.

Various conditions and substances have the effect of destroying rubber. Oils or fatty matter and acids are two of the commonest enemies to it. Both are found in milk, and therefore it is absolutely necessary to remove from the rubbers all traces of milk, which should never on any account be allowed to become dry on the various parts. Air, light and heat have the effect of perishing and cracking rubber, and once this occurs with milking machine parts they should be discarded, for good cream cannot then be produced.

A practice that is far too common at Tumut is that of merely drawing water through the machines, running a brush through the milk line and then leaving the teat cups and tubes hanging in the bails till next milking. Under such conditions the rubber becomes perished in a week or two and trouble ensues. The sooner dairymen realise that the plant *must* be pulled to pieces *at least once a day*, and the brush put through all rubber parts and all tubing, the sooner their cream will show an improvement and the better it will be for themselves. The proper washing of the plant is only light work, and it would pay many of the farmers in a large way to employ a youth or boy to do nothing else. Cases have come under notice of farmers losing as much as £40 per month through second-grade cream. Would it not pay such men to spend even as much as £5 per week on labour, if by so doing they could ensure nothing but "choicest"?

While the rubbers and teat cups may perhaps be left hanging in the bails after the evening milking, after the morning milking they should be immediately rinsed out with warm water to remove remnants of milk, then pulled down and thoroughly cleaned, and finally all rubber should be immersed

in a solution of formalin or lime water. Formalin is preferable to lime when used in water for immersing the rubber parts and teat cups. Lime always discolours the metal parts of the teat cups, and in the case of aluminium cups will entirely blacken them, as well as causing a pitting in the metal itself. Lime-water causes a sliminess both inside and outside the rubbers, and when this is very pronounced it requires cleaning off prior to using the machines. Any water remaining in the machines after immersion in formalin-treated water is very easily removed from the interior of the machine tubing and piping by merely sucking some scalding water through them before use.

Farmers, when buying a plant, should select one in which the teat cups are easily pulled to pieces. Inflations then need only be placed in the formalin or lime water, the purpose of which is to preserve and lengthen the life of the

A View in the Tumut Valley.

rubber parts, by keeping them away from the air. Alkalis tend to preserve rubber, and lime water, being alkaline, has this effect. One farmer who uses machines with success keeps a double set of rubber parts, which are used alternately for a few weeks at a time, the spare set being kept, when not in use, in French chalk. The preserving effect of French chalk on rubber is well known, and the rubbers are always in the best of condition. Once any rubber part becomes sticky, perished, or cracked, it should be discarded.

Use Soda and Soap.

It is nothing less than astonishing to anyone visiting farms at Tumut to find such a large number of farms without a stock of either washing soda or soap. Both of these articles are cheap, and washing-up cannot be done properly without them. This applies to hand-milking as well as machine-

milking. How it is that farmers who do not use either soda or soap when washing-up do not get more second-grade cream cannot be explained, unless the excellent climate has something to do with it. The water from wells, used on most farms, is hard, and soda is essential to soften it, while for the quick and complete removal of all grease and milk it should always be used either alone or in conjunction with soap. Soap should be used, though only with soft water or with water that has been softened. With hard water it invariably curdles or produces masses of flocculent matter, which, in the case of milking machines, will adhere to the rubber parts.

Not only at Tumut, but in many other dairying districts, there seems to be a needless prejudice among dairy farmers against the use of soap for washing-up. It is stated that it will taint the cream, but as utensils should always be scalded with clean water after washing, this statement cannot be entertained. It may be that farmers are afraid to use soap, because in bygone days it was a common practice to use it for blocking up holes in leaky cans or buckets. Many dairymen were rightly prosecuted for doing this, and, as a result it almost seems as if a rush to the other extreme has occurred, and soap is now looked upon as a potential cause of trouble. Soap may advantageously be used in washing utensils by every dairy farmer, and by rendering it necessary to wash off all suds by scalding after washing it is performing a double purpose.

Get Rid of the First Milk.

Another bad practice is the general failure to remove the first milk before applying the teat cups. It does not appear to be known that the first milk from each teat is unclean, and not fit to mix with the bulk. With a releaser plant, moreover, this is the only opportunity the milker has of ascertaining if all is as it should be with the udder. Sometimes injuries occur, or the milk may be affected by disease, as in the case of mammitis. If the milker claps the teat cups on without taking any precautions against such possibilities, he will sometimes strike trouble and then probably blame the machines.

Conclusion.

The foregoing are some of the outstanding defects in dairy-farm practice, and it cannot be said that any of them are difficult to remedy. In theory, cream from machine-milking should be better than cream from hand-milking. In practice it rarely is, but only (in most cases) because of lack of care or knowledge.

However, because "machine cream" is subjected to a totally different set of conditions, it will probably always be, to some extent, different in character to "hand-milked cream." Care on the farmer's part will result in a cream equally as good as can be produced by hand. The flavour of cream is dependent nearly always upon the nature of the germ life present in it, and if during its production cream has been subjected to contact with anything of an offensive nature—such as only too often is present in the tubes of a milking machine—then the cream itself must of necessity be offensive also.

Beans in the Gosford District.

J. DOUGLASS, H.D.A. Agricultural Instructor.

SOME idea of the importance of pod beans in the Erina Shire can be gathered from the area annually sown in the district to that crop. The localities which are most suitable for the crop include Terrigal, Tumbi, Tuggerah, Matcham, Wamberal, Wyong, Gosford, and Kinkumber. A very moderate estimate of the area planted to beans in these localities would be from 600 to 700 acres, including main and late crops. The area grown by individual growers varies from 1 to 12 acres, the average being about 2½ acres. Orchardists utilise the area between young trees to produce beans as a catch crop, and many small holders grow limited areas for home use and for the local market, though the area sown by these two classes varies a good deal and is not included in the estimate given above.

Although not as early as "River beans" (Tweed), the Gosford produce has the advantage of being favourably situated as to the markets. The beans have only a short distance to travel by rail to the Newcastle or Sydney markets, and are usually in the best of condition when they arrive.

The centres which are most suitable for the production of very early beans, are situated along the coast, well elevated, with a north-easterly to northerly aspect, protected from the prevailing southerly winds. Tumbi is usually recognised as the earliest centre, and is generally given the credit of placing the first local beans on the Sydney market, the first pickings arriving towards the end of September. Prices ranging to 25s. per bushel are obtained for these early beans. Kinkumber and Terrigal follow in this order, both localities being situated near the coast. Wamberal, Matcham, Wyong, and Gosford are recognised as slightly later districts. In normal years the growers in the Tumbi centre plant about mid-June for the very early crop. Kincumber and Terrigal growers plant during early July, while in the other centres planting takes place up till the end of July or first week in August.

Growers in all localities make it a practice to keep planting small areas until the end of August. September and October are months usually avoided for planting, as the resultant crop comes on to a well supplied or glutted market.

The Erina growers resume planting at mid-November, continuing on till early January. The yields obtained from these later planted crops are usually very heavy. They are ready to be picked when the heavy supplies are beginning to go off the markets, and the result is that the price obtained is usually fair to good. Considering the heavy yields obtained the returns to the growers are very satisfactory.

Planting is again suspended from early January to late February, as the bean fly makes its appearance on beans planted at this time, doing considerable damage. In certain localities areas are sown to beans for the

late autumn and winter market. This crop is considered by many growers to be just as important as the early crop. The prices realised are usually very good, but the yield is rather uncertain owing to risk of unseasonable weather retarding the normal development of the pods. Localities suited for very early beans are also best suited for late bean growing. Planting time for late crops extends from March to early April.

The soils of the Erina Shire are very patchy, varying from pure white sand to a mixture of ironstone and heavy yellow clay. The heavier soil is usually stony and barren, and is not cultivated. The better type of soil is a friable, dark, sandy loam. The physical condition of the sandy loams is excellent for bean production, being open, well aerated, easily worked, and naturally well drained. As a rule the soil is not very rich, but contains a fair amount of humus, a factor which is largely responsible for the

A Nice Crop of French Beans at Terrigal

excellent water-holding capacity. The natural drainage of the soil is practically ideal, a layer of gravel being found immediately under the surface soil at a depth varying from 1 to 5 feet. The layer of gravel varies in depth, and overlies heavy clay. These substratas, while providing good drainage, also prevent surface erosion.

The physical composition of the soil makes cultivation a comparatively simple operation. The weed trouble is not as bad as would be expected in a district of such high rainfall, largely owing to the fact that the farms are more or less isolated and surrounded by virgin scrub.

A well worked fallow in normal seasons, enables sufficient moisture to be conserved to ensure a good germination without rain. The system of cultivation practised in most cases is good, although little attention is given to crop rotation.

The seed is planted in shallow drills 2 feet 6 inches to 3 feet apart. Where possible it is advisable to run the rows north or north-east, with the object of allowing the sun to penetrate down the rows during the best part of the day. Shallow drills are opened up with a hoe, and the seed is dropped by hand at the rate of 1 bushel per acre. This amount is increased for the early plantings, as the germination is doubtful during cold weather.

Shallow planting is essential for early crops as the soil is cold, and the seedlings being weak are unable to push their way through any depth of soil. Abundance of moisture is available during the winter months, as the winter rainfall is very heavy. In abnormally cold and wet years the germination of the early crop is very slow and much seed decays. July, 1925, was very cold and wet, with the result that many crops took six weeks to germinate. Although a certain amount of seed decayed, fair stands were obtained.

As the soil becomes warmer the germination of the different plantings quickens and improves, until with the main crop, the whole of the seed will be up within one week of planting, providing sufficient moisture is present.

As soon as the plants are a few inches high, cultivation is carried out. On the sloping areas the rows are worked through with a hoe, but on the flat land a single-horse cultivator is used. The first cultivations carried out are rather deep, so as to improve the drainage and aeration of the surface soil, and to increase the soil temperature. Hilling the rows is carried out while the plants are about half grown; this prevents the plants from being blown over, and ensures a greater feeding area for the surface roots.

With the advent of warm weather the plants flower profusely and quickly set up a crop of beans which develop rapidly. Under favourable conditions the plants keep flowering over a considerable period, thus producing a regular supply of pods, which necessitates going over the crop at regular intervals to harvest the beans. The early and late crops, growing under abnormal conditions, take longer to set and produce pods than mid-season crops. The latter in this district produce profitable pickings of beans for periods extending over three months.

Picking is carried out during the day, and the beans are placed on the evening trains for the different markets, where they are sold early next morning. During the hot weather it is advisable to cool the beans and damp them before dispatching. Damping prevents wilting and enables the produce to be placed on the market in the best condition.

From the earliest planted beans (June) a yield of from 150 to 200 bushels per acre is usually obtained. Those planted at the end of July produce, on an average, 200 to 250 bushels per acre, while those planted at the end of July or later, produce 250 bushels per acre and over, according to the season.

Manurial Trial.

The Department of Agriculture is assisting the bean growers in this district by carrying out a series of experiments, including variety and manurial trials.

The majority of farmers in the district use manure with the bean crop, but owing to lack of reliable data are at a loss as to the right kind and amount. The Department carried out a manurial trial in conjunction with Mr. J. V. Parry, of Terrigal, during the past spring, and the value of the application of manure was indicated by the marked results obtained.

The soil was a light sandy loam, typical of the district, and had been fallowed over the winter. At planting time (3rd November), the seed-bed was moist and in excellent condition. Shallow drills were struck out, and the manure was mixed with the soil before the seed was planted. The growing season was very dry, but plenty of moisture had been conserved during the fallow. Four pickings were made, but the hot weather during January and February burnt the foliage and prevented the further development of pods. The yields obtained were exceptionally good, considering the rain that fell during the growing period only consisted of 340 points in November, 165 in December, 87 in January, and nil in February, a total of 592 points.

The yields also indicate the suitability of the bean crop to the district. Although the season was dry the results are comparable, but cannot be considered conclusive.

An increase of 150 bushels per acre was obtained over a no-manure plot, by the application of 280 lb. of superphosphate. Basic superphosphate, used at the rate of 326 lb. per acre, gave the highest yields with a total of 402 bushels 12 lb., representing an increase of 153 bushels per acre over unmanured plots. When the amount of superphosphate was doubled there was a substantial reduction in yield, the plot only showing an increase of 62 bushels per acre over the no-manure plot. The results are very interesting, but are not to be taken as conclusive. The dry season favoured the lighter application of manure. The results follow:—

	bus.	lb.		bus.	lb.
No manure	249	19	*P1 (322 lb.)	357	4
Basic superphosphate (326 lb.)...	402	12	*P7 (252 lb.)	341	4
Superphosphate (280 lb) ...	400	2	Superphosphate (560 lb.) ...	311	21
*P2 (322 lb.)	384	3			

* These mixtures are made up as follows :—P2 consists of 10 parts of superphosphate and 1½ parts of sulphate of potash ; P1 consists of 10 parts superphosphate and 1½ parts sulphate of ammonia ; P7 consists of superphosphate and bonedust in equal parts.

WHILE preference must be given to the catchment, it is important that a tank should be located in a central position to save the stock from much travelling to and from water. If possible, the site should be near a belt of green timber, as stock come to water in the morning and like to linger around in the shade, taking frequent drinks before moving off in the afternoon. If shade is not available they probably take only one drink in the day, and consequently do not do as well as they otherwise would.

Aspects of Milk Grading for the Cheesemaker.

A. B. SHELTON, Assistant Dairy Instructor.

With the more general adoption of pasteurisation of milk for cheesemaking, we should bear in mind that, although it eliminates many of the troubles a cheesemaker has to contend with in milk received from dairies not under his control, it does not constitute a remedy for all classes of contaminated and abnormal milk. Careful grading of milk, immediate pasteurisation, and addition of starter, makes it possible for trained cheesemakers to market a product uniform in flavour, texture and condition; but if the milk is not carefully examined to eliminate badly contaminated lots, albuminous milks, and other abnormal milks which may be detected, trouble will certainly ensue.

Under the heading of contaminated milk could be placed milk which (possibly through holding over-night in doubtful surroundings) has developed fermentations of an unclean nature. In this case, pasteurisation, although destroying the yeasts or bacteria causing the trouble, does not destroy, in many instances, the toxins secreted by them, and leaves these free to set up chemical actions on different milk constituents.

Milk from newly-calved cows, which contains a high percentage of albumin, is likewise not improved by pasteurisation, and even if not affected enough to hold up the manufacturing process, will invariably give rise to "off" flavours in the resulting cheese.

Abnormal milks, such as from cows suffering from the effects of drought or dearth of protein feed and mineral matter, will often render it difficult to obtain a proper coagulum, and this trouble may be accentuated when such milk is pasteurised. Hence, the need for strict attention to grading out of such milk, and the use of some simple test on succeeding supplies if undesirable flavours still occur.

The Wisconsin curd test is a valuable aid in this respect, and one that is easily and efficiently conducted under factory conditions. The writer had an experience with albuminous milk which indicated the value of the test, both in detecting the cause and convincing the farmer supplying the milk.

In this case a distinctly albuminous odour developed in the cheese vat during the cooking process and rapidly became worse in the curd during the cheddaring process. Location of the source by taste having failed, the curd test was resorted to, each supplier's milk being sampled and each sample coagulated by rennet, cut, drained, and held overnight in closed jars. On the testing of each jar for odour next morning, the offensive albuminous smell was found very strongly in one jar only. The supplier concerned was

Means of Eradication.

The most effective method of checking the spread of this pest is to prevent it from seeding. Frequent cutting, especially just as the plant is coming into full blossom, will prevent it from maturing its seeds. Thorough cultivation will tend to suppress this and other weeds. Copper sulphate at 5 to 7 per cent., used at the rate of 40 to 75 gallons per acre, is effective in checking certain weeds, and should be given a trial with this when the plants are in vigorous growth, just before they commence to flower.

For farmers' purposes in its control, the Glaucous Star Thistle is almost identical with Saffron Thistle, and Mr. E. S. Clayton, Senior Agricultural Instructor, informs me that some suggestions regarding the latter, published in the *Agricultural Gazette* for May, page 383, are quite applicable in this case.

Control of "Hairy Root" of Apple.

The condition known as "hairy root" of apple is caused by the same organism as that responsible for the production of "crown gall," namely, *Bacterium tumefaciens*. The control measures are purely preventive, as no treatment is effective after infection has occurred. These measures can be applied in the nursery at grafting, when every effort should be made to prevent infection. A considerable measure of success has been obtained by disinfection of knives, stocks, and scions at this period.

For general purposes, however, it is recommended that stock showing a crown gall or hairy root condition should not be planted. Hairy root is not considered as serious as the crown gall condition, and at times when superficial examination only is possible it is hard to distinguish the hairy root condition from a type of root development which is rather characteristic of Northern Spy stocks.—R. J. Noble, Principal Assistant Biologist.

Preservation of Fruit with Sulphur Dioxide.

According to the *Fruit Grower*, London, the action of sulphur dioxide as a preservative for fruit has been the subject of experiments at Long Ashton Research Station, England. The main result of the work has been not so much to improve the position in respect of the fruit pulping method, as to provide an alternative method of preserving the fruit which possesses great advantages over the pulping method. The most important of these are :—(*a*) A great saving in time, the fresh fruit being packed direct into the storage vessels and then simply covered with the preservative solution and sealed down ; (*b*) larger quantities of fruit can be preserved during the fruit season ; (*c*) no preliminary cooking or pulping is necessary ; (*d*) the fruit is preserved whole instead of being reduced to a state of pulp ; (*e*) less sulphur dioxide is required for preservation ; (*f*) the costs of preservation are reduced very greatly by the elimination of the boiling and pulping process ; (*g*) the preserved material keeps better ; (*h*) the quality of the jam made from the preserved material is much superior.

The Control of Woolly Aphis.

METHODS THAT ARE AVAILABLE.

W. B. GURNEY, B.Sc., F.E.S., Government Entomologist, and
W. LE GAY BRERETON, Assistant Fruit Expert.

WOOLLY aphis (*Eriosoma lanigera*) is a true aphis which sucks the sap of the apple tree, which is its principal host, by inserting its beak or rostrum through the bark. The effect of thousands of these aphids sucking sap is to cause scars and gall-like swellings on the limbs and twigs. Infestation is first indicated by masses of white filaments, like tufts of cotton wool, which appear on the twigs and beneath which the aphids, dark coloured of a uniform brown or a dark slaty-blue colour, will be found.

The woolly aphis also infests and aborts the roots of apple trees as well as the limbs, unless blight-proof stocks are employed. Certain varieties of apples are found to be practically blight-proof, and if susceptible varieties are grafted or budded on to these blight-proof stocks, none or scarcely any of the aphids will live on the roots; root treatment is not then necessary, though the trunk and limbs of the grafted tree may still become infested. Woolly aphis is, therefore, still a serious pest, often needing frequent sprayings to keep it in check. The aphis reproduce so rapidly that even a few weeks after an apparently successful spraying, the aphis may be thickly present again, owing to the rapid development from the few aphids which escape the spray.

Control Measures.

In our hot, dry climates this pest gives little or no trouble in normal seasons, but in regions where the summer is milder and moister, frequent spraying must be resorted to in order to keep it in check, or aphis-liable apple trees will become so damaged that their cropping will be seriously reduced and the fruit they do produce will be blackened, especially round the stalk end, by the fumagine developed on the excreta from the aphis.

Even in aphis-liable districts the attack is less severe during abnormally hot and dry summers, and in such cases spraying can be much reduced.

Autumn or Early Winter Treatment.—It it generally during the busy time of the apple-picking season that woolly aphis gets ahead, as time cannot be spared to give it attention; moreover, some sprays such as tobacco wash will leave stains on the fruit if applied too close to picking time. Thus, as soon as the foliage commences to thin out in the autumn the trees should be sprayed with a contact spray, such as tobacco wash or a commercial extract of tobacco.

The spraying is far more efficient and more quickly carried out when applied at high pressure—not under 200 lb. The nozzle should be held close to all affected parts so that the clusters of the insects may be broken up by the spray soon after it leaves the nozzle and before it breaks up into a mist and loses its force. If the trees are badly infested, as they often are at this season, and are large, spraying in the above manner (which is sometimes termed a drenching spray, to distinguish it from a mist spray) uses a large quantity of spray per tree, much of which runs down the limbs and collects in a pool at the butt. For this reason it is advisable to use a harmless spray such as tobacco for the autumn "clean up" application rather than an oil spray, which is liable to injure the trees if allowed to accumulate in a pool round the butt.

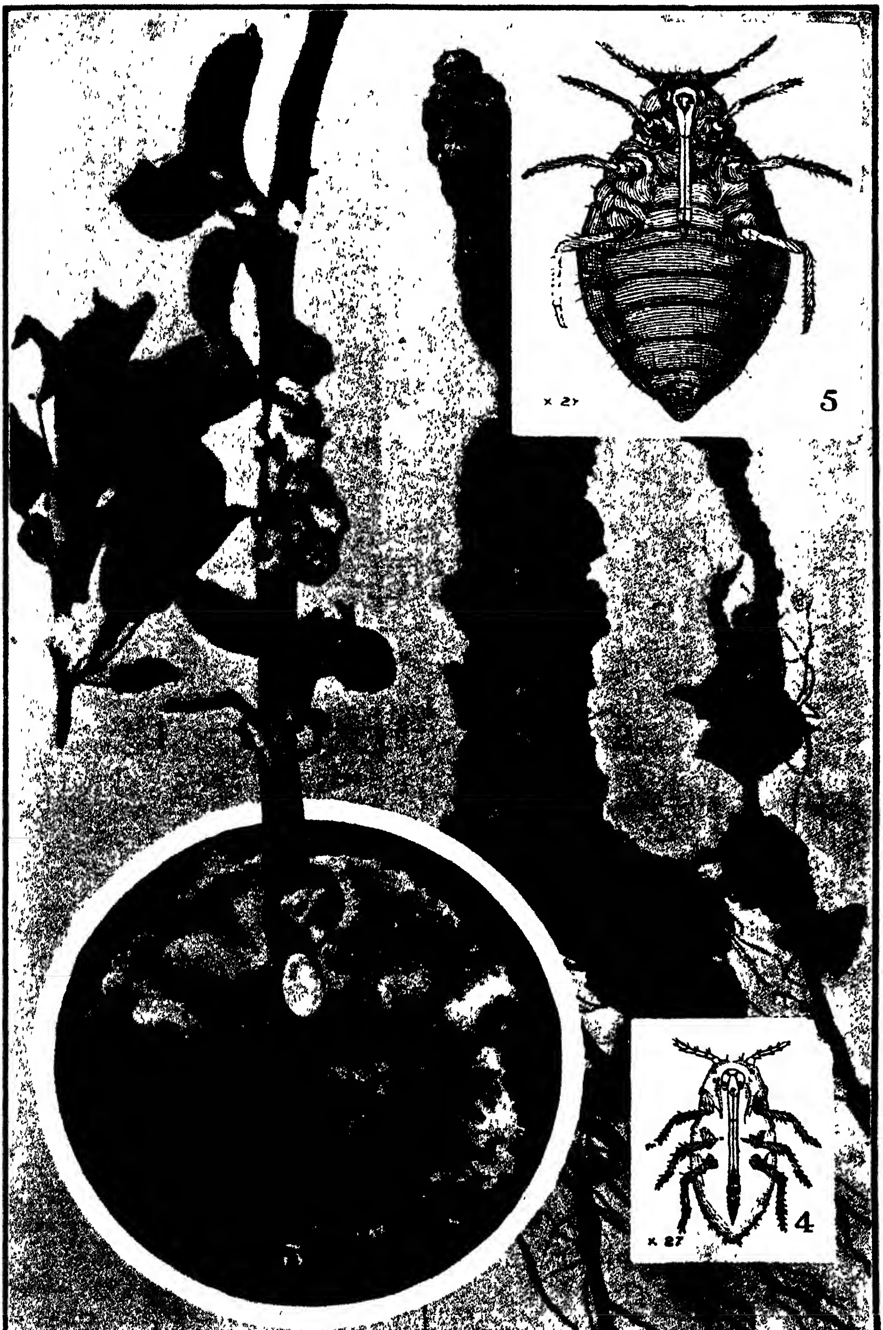
An autumn application that, for the past two years, has been observed by Mr. D. Atkins, Orchard Inspector at Orange, to hold the woolly aphis in check to a considerable extent throughout the season, consists of caustic soda 2 lb., nicotine sulphate (40 per cent.) ¾ pint, water 100 gallons.

Although this treatment has not been fully tested, it is worth a trial in orchards where the parasite *Aphelinus mali* has not been established. Mr. Atkins recommends halving the amount of caustic soda the second year of use, as the effects of the annual application of caustic soda have not been determined. Further tests may show that a smaller quantity than 2 lb. may be sufficient in the first treatment.

Late Winter or Early Spring Treatment.—The woolly aphis will often be found to develop to some extent during mild periods in the winter and it is advisable to check it again before the trees break into foliage. Because oil has such penetrating properties, the miscible spray oils are very suitable for this application. If the earlier "clean up" spray has been thoroughly carried out, the aphis which have developed since will be chiefly found about callousing wounds, into which the spray oil will to some extent penetrate. When making this application it is only necessary to make a mist application, except just in those places where the operator sees the aphis developing; thus this application can be carried out without excessive quantities of spray collecting round the butts of the trees.

It is safe to use oil if the trees are not past the early signs of the buds or spurs swelling. In order to make this application last as long as possible into the warmer weather, when the aphis will be becoming increasingly active, it should be delayed as late as possible consistent with safety and certainty of getting it through, taking the chances of hold-ups by rain into consideration. The time will vary with variety and locality, but in most of the tableland districts, August to early September is the main period.

If San Jose or Mussel scale be present in the orchard, oil spray will also be useful in checking the pest. The strength of the oil spray will vary according to the brand used, but will run from 1 to 20 to 1 to 25 of water by volume—reducing the water 20 per cent. if Mussel scale is troublesome.



Woolly Aphis.

1.—Affected twigs. 2.—Roots showing galls caused by woolly aphis. 3.—Portion of root infested with active aphis. 4.—Larva of woolly aphis. 5.—Mature female.

By experiments carried out in Glen Innes Experiment Orchard, it has been found that by combining tobacco wash or commercial nicotine extracts with the first fungicide (lime-sulphur, atomic sulphur, colloidal sulphur) spray applied from "spur burst" to "pinking" stage before the trees are dense with foliage, the trees are kept clean of woolly aphis just as long into the spring or early summer as the somewhat earlier applied oil spray. Thus where these early fungicides are necessary and the oil not required for other pests, it can be dispensed with and the tobacco wash or nicotine combined with the fungicide.

It is also worthy of note that on some occasions both in the Experiment and other orchards a remarkably effective and lasting result has been obtained by a combination of lime-sulphur (winter strength) and tobacco wash or commercial nicotine extract applied when the buds were swelling. Though this combination has not consistently given these very excellent results it has never shown inferiority to the oil spray, so that if lime-sulphur is being used as an early spring application, it is well worth while combining tobacco wash or nicotine extract with it to check woolly aphis if present.

Tests carried out by the Victorian Department of Agriculture with a combination of spray oil 1 gallon and nicotine sulphate (40 per cent.) 1 pint, soap 2 lb., and water 80 gallons, gave very favourable results as a winter spray for woolly aphis. Tests commenced during 1925 on the above lines by the New South Wales Department did not in the first season show such good results as obtained in Victoria, but, of course, reliable conclusions cannot be made from the results of one season.

Summer Treatment.—As a rule the results of the above treatments are of short duration, and as summer advances the aphis multiplies more rapidly, requiring applications of a contact insecticide which is not injurious to the fruit or foliage. Of those already thoroughly tested, tobacco extract—either commercial or home made—has proven the most satisfactory.

The late spring and summer applications should be sufficiently frequent to check the spread of woolly aphis throughout the tree, but unfortunately it is not always practicable to give sufficient attention to these sprayings to obtain this result.

Tobacco wash prepared without soda and many of the commercial extracts may be combined with lead arsenate with safety, and the aphis can be checked by using this combination when making the regular applications for codlin moth. The only drawback to this combination or to combining tobacco extract with the last fungicide applications (lime-sulphur, colloidal or atomic sulphur, or Bordeaux mixture) is that the lead arsenite or fungicide should be applied as far as practicable as a "mist" spray, whereas the tobacco extract needs to be applied as a "drenching" spray; hence when using the combination one is obliged to use a greater quantity of lead arsenate or the fungicide than would be necessary if applying these in the

normal way. This can to some extent be minimised if the pest has not got a bad spread through the tree, by the operator spraying normally through the tree, only giving the necessary drenching application where the patches of aphis occur.

Forty per cent. nicotine sulphate is generally diluted 1 to 800 of water by volume (1 pint to 100 gallons of water) for woolly aphis. For the preparation of tobacco wash, see Spray Leaflet No. 2, obtainable from the Department, but as the nicotine content of tobacco varies it is advisable to increase the mid-rib waste tobacco to not less than 1 lb. to 2½ gallons of water. When combining this with other sprays care should be taken that the right proportion of each spray material is maintained to total quantity of liquid.

Soap may be added to nicotine sulphate, but it is doubtful whether the increase in efficiency is worth the extra cost. Soap added to tobacco wash sometimes curdles, and will then give trouble in the valves of the pump.

Miscible spray oil in varying quantities has been tested with tobacco wash as a summer spray for woolly aphis at the Glen Innes Experiment Orchard. Up to the present these tests have shown that quantities of oils under 2 pints to 100 gallons of tobacco spray have resulted in no appreciable improvements. Two, three, and four pints of miscible spray oil to 100 gallons of tobacco spray have increased the efficiency of the spray, the larger quantities of oil being more effective than the smaller.

These tests are not complete, but are given for the benefit of those who might like to give the combination a trial as a summer spray. Although 4 pints of miscible spray oil to 100 gallons of tobacco showed no injury to either fruit or foliage, this quantity has only been tested for one season, and a warning is given that under varying conditions this quantity might result in injury.

Previous tests carried out by the Department some years ago showed that miscible oil 1 to 100 of water by volume applied during the growing season caused some defoliation and pitting of the green fruit, though the weather conditions following the application of the oil spray had much to do with the extent of injury.

Fumigation.—This was tried on an extensive scale on two of the Departmental orchards, but though it cleaned up the trees very thoroughly for a period it had a very short lasting effect and was too expensive.

Auxiliary Treatments.—It is generally found that woolly aphis first reappears in callousing wounds. The painting of these, taking care that the brush gets well into the crevice under the rolls of encroaching callus will check the aphis till the fresh callus grows out of the paint. On trees on which the aphis has not hitherto been severe enough to cause galls or extensive lesions of the bark, the aphis can be prevented from spreading throughout the tree by repeated painting of any callousing wounds whenever the aphis appears, with a thick slow drying oil. But, of course, such

a method is only practicable on a limited number of comparatively small trees. Because callousing wounds form breeding grounds for woolly aphis, large cuts which take some years to heal perfectly should be avoided when pruning aphis-liable apple trees. Hence in forming young aphis-liable apple trees it is not a good policy to leave temporary main limbs which will later necessitate heavy cuts. It is true that pruning generally keeps up a supply of young succulent shoots which the woolly aphis prefers, and that trees entirely unpruned are less severely attacked, but it is not practicable to dispense with pruning under conditions prevailing in many of the apple districts of this State.

Nozzles.—A fan-shaped spray, similar to that thrown by the Bordeaux type of nozzle, is most effective in removing aphis, but unfortunately these nozzles are constantly getting out of adjustment and cause too much loss of time; on the whole a cyclone action nozzle, which throws a solid cone is the most convenient—the chief point being to hold it close enough to affected parts to break up the clusters. Most of the cyclone nozzles are now made so that the jets can be replaced and a coarser jet can be used than when a mist spray is required. As the apertures of the jets wear it is a good plan to keep the old jets which have enlarged during previous spray operations for the woolly aphis application. As a rule single nozzles only on each lead of hose should be used for woolly aphis. As the aphis must be hit direct to shift them, one nozzle is often running to waste if double nozzles on each lead of hose are used. The nozzles should be set at an angle of about 45 degrees to the extension rod to facilitate speedy change of direction of the spray. Long-distance nozzles, such as the gun and pistol, are the best to use on trees of any size when spraying for woolly aphis if the pump outfit is sufficiently powerful.

From the foregoing it can be seen that woolly aphis is a very troublesome pest to deal with in many of our apple districts and adds much to the cost of production. It is for these reasons that so much interest is taken in the recently introduced parasite, and even if it only reduces the number of applications of spray necessary it will be a great boon to the grower.

Control by the Chalcid Parasite (*Aphelinus mali*).

The Entomologist has introduced, after adequate quarantine, the useful chalcid parasite of woolly aphis known as *Aphelinus mali*. These parasites were first carefully developed in an insectary, and later, on covered aphis-infested trees. The parasites were distributed last year and this year to some 250 fruitgrowers' associations and orchardists throughout the main apple-growing districts of the State. To date parasites have been distributed to and have been established in the following districts:—Sydney (county of Cumberland and adjacent districts), Bathurst, Batlow, Armidale, Uralla, Aylmerton, Glen Innes, Kentucky, Blue Mountains, Orange, Molong, Penrose-Kareela, Mittagong, Albury, Bega, Wingello, the Irrigation Area, &c. It is intended to redistribute the parasite from these

numerous centres and from Sydney as rapidly as it can be developed. It is, therefore, only a matter of time when all orchardists will have the parasites established to assist in the control of woolly aphis.

Life History of the Parasite.—The parasite may be described as an extremely minute black chalcid wasp, only about one twenty-fifth of an inch long and therefore scarcely visible to the naked eye. The adult males live only a few days while the females may live for a week or more. The males and females pair, then the females search for woolly aphis and lay in each aphis a single egg, thus parasitising some dozens of aphis. The egg hatches inside the body of the aphis into a tiny wasp grub; it feeds on and kills the aphis, and eventually changes to a minute pupa within the dead body of the aphis. The parasitised aphis when dead turns black, but the swollen skin still remains attached to the twig and shows up conspicuously. The pupal wasp then changes to the active little black adult wasp which bites its way out of the body of the aphis leaving a tiny circular hole. The females of this new brood of wasps again parasitise more of the aphis. The life cycle of the wasp occupies a period of about five weeks, and as each female lays about fifty eggs, the rate of increase is very rapid. Eventually the parasites become so abundant that they may wipe out an infestation of the trees before the end of the season.

Effects of Spraying.—Arsenical sprays do not affect the parasite, nor is it thought that contact sprays seriously reduce the parasite except by killing the adults on the leaves and twigs; but spraying to reduce the woolly aphis by killing the aphis would prevent the parasites from finding sufficient aphis in which to lay their eggs. When the parasite is introduced on to one or two trees in an orchard, these trees should be left unsprayed to permit the parasite to increase there rapidly. If the other trees of the orchard are badly infested with aphis they could be sprayed once to check the aphis and then the trees left and the parasites allowed to develop and spread to control the aphis on these trees. In large orchards it may be necessary to spray more than once until the parasites have increased and spread sufficiently to make their presence felt in control.

Hibernation of the Parasite.—The wasp parasite passes the winter months in the quiescent pupal stage inside the dead bodies of the aphis on twigs and limbs, the butts of the trees, and even on and in the soil around the trees. Prunings showing dead parasitised woolly aphis upon them should be carfeully kept in a dry place or else tied to the trees to help to start the broods of parasites early the following spring. Twigs with parasitised aphis should be sent to adjacent orchardists requiring the parasite, thus aiding in the general distribution and permanent establishment of the parasites throughout the district. This further distribution of the parasites to other orchardists without them is of mutual advantage and incumbent upon growers if they wish the parasite to become a permanent factor for the control of the aphis in their districts. This parasite will also work on some of the other dark-bodied aphis of our fruit trees, and sometimes even on rose aphis.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize :—	
Fitzroy	L. Waters, Yarramalong.
	F. W. Hill, "Willow Vale," Yarramalong.
	R. W. Hindmarsh, "Wiaraga," Bellingen.
Large Red Hogan .. .	Principal, Hawkesbury Agricultural College, Richmond.
Leaming	Manager, Experiment Farm, Grafton.
Ulmarra Whitecap	R. W. Hindmarsh, "Wiaraga," Bellingen.
Potatoes :—	
Factor	K. Bowen, "Belleview," Springside.
Early Manhattan	K. Bowen, "Belleview," Springside.
Broom Millet :—	
White Italian	W. Lye, Loomberah.

A number of crops were inspected and passed, but samples of the seed harvested hav not been received, and these crops have not been listed.

Plums and Prunes at Young.

"The following may be of some interest to growers of President plums and Robe de Sargent prunes. I have these growing in one row and planted alternately, and for three years they have borne very heavy crops, while others growing separately some distance away have been shy bearers. Several other growers around Young have had the same experience, especially where President plums are planted in blocks with no other variety near. Some are budding a few limbs of these trees with Robe de Sargent prunes. These two varieties appear to fertilise each other."—S. A. Thornell, Fruit Inspector, in recent report.

Education as a Factor in Better Sales.

One of the means of attaining an increase in sales is to increase the professional knowledge of the producer. . . . The quality of the products increases the market value, and depends, for the greater part, upon the quality of the raw material. When the dairyman does not sufficiently lend a hand to increasing the proceeds of his products as much as possible by improving the quality . . . it must be partly attributed to his want of professional knowledge, in consequence of which he does not see the connection between his shortcomings and the consequences with respect to the quality of his products. He will co-operate more effectually when he knows not only what he must do, but understands at the same time why he should do it.—Dr. L. T. C. Schey, Government Dairy Counsellor, Hoorn, Holland.

Poultry Notes.

July

RELATIONSHIP BETWEEN BREEDS AND PRODUCTION.

JAMES HADLINGTON, Poultry Expert.*

Every poultry-farmer is to some extent a breeder of poultry, but it is not in the nature of things that every poultry-farmer should or could be a skilled breeder. Many do not aspire to become such, and make no pretences on that score. On the other hand there are many who have such ambitions, but who lack the essential knowledge and skill to enable them to take their place as successful stud breeders. It is the latter class that mostly fall into the error of endeavouring to breed poultry by mathematically following blood lines. This appears to them scientific; as a matter of fact, such procedure is not only unscientific, but amateurish, and to an extent foolish.

Breeding is an art rather than a science, or if you like, a combination of both, but without the art all the scientific knowledge of genetics will not constitute one a successful breeder of any animal. There have lived many thousands of successful stud breeders who knew nothing of the theory of breeding, but who had learnt the art of breeding. They had learnt to know their breed, and were possessed of the natural intuition that alone can make a skilled breeder. Such persons will almost unerringly select the right specimens to breed from. This knowledge and aptitude are the main factors in the art of breeding.

This being the case, it is too much to expect that everyone who takes up commercial poultry-farming can be a genius as a stud breeder. In making these observations on fundamental principles I have no desire to deprecate or to discourage, but only to state facts which will enable me to bring home to poultry-farmers their true position in relation to the breeds upon which they are dependent for the success of their business.

Preservation of Breeds.

At the present time the poultry industry is dependent upon as few breeds as can be counted on the fingers of one hand, and almost on three breeds, with two out of the three (Leghorns and Orpingtons) constituting fully two-thirds of the birds run on commercial farms in this State. The necessity for safeguarding these breeds at once becomes apparent; even more so when we realise that these few breeds are the result of the sifting-out by experience in egg-laying competitions from about thirty breeds that have taken part in them from their inception some twenty-four years ago. I would emphasise that there are good, indifferent, and bad laying breeds.

These facts are mentioned with the object of showing that "breed" is the greatest factor in the business of poultry-farming. The preservation of the breeds then, is of vital importance to our industry; yet we have to own to

* Paper read at the Eighteenth Annual Conference of Poultry Farmers at Hawkesbury Agricultural College, 26th June, 1926.

the fact that they have become so contaminated that one almost despairs of securing reliable blood to carry on with. Who, for instance, is not familiar with evidences of impurity, such as colour in a white breed, white or other colour in a black one, legs of a colour other than that set out for the breed, feathers on the legs of breeds that should have clean shanks, brown or tinted eggs laid by breeds that should lay white eggs, and the reverse, apart from departures from type and character? All these and more are evidences of impurity of breed. There are some clear-cut issues in this regard: Practically all breeds of European origin have clean legs, *i.e.*, not feathered, and they lay white eggs and are non-broody; while those of Asiatic origin mostly have feathers on the legs, lay brown eggs, and go broody. It can therefore be readily understood how vital are these signs to the breeder of pure stock.

"But," said the average commercial farmer of only a few years ago, "I am not concerned about these things. I want birds that will lay the greatest number of eggs." This outlook and the lack of appreciation of the true facts has had a most damaging effect on the purity of breeds, and is fraught with serious consequences to the industry.

A Change Coming.

I am pleased indeed to observe a change of attitude towards this all-important phase of breeding for egg production and quality—shown by the improvement in quality of birds exhibited in the commercial classes at our big shows during the last two or three years. There is, too, ample evidence of a change in attitude among poultry-farmers at the present time. This change is most gratifying to me, since in the past I have had to contend with the opposite outlook, which could only visualise breeding for egg production without regard to purity of breed. Unfortunately this outlook has not been confined to our own State, or indeed to Australia, but it has been to some extent universal—the outcome of a swing-back of the pendulum, as it were, from extremes in the breeding of birds for "fancy," with its attendant exaggerations, to that of extremes in utility, where nothing else mattered but eggs.

Having indicated the position in which we stand to-day with regard to the breeds, I now propose to show how this state of things has been brought about, and to suggest improved methods of breeding with a view to the salvation of the breeds which stand for so much in our industry.

Departures from Breed Standard.

To deal with the question, what has brought about impurity and to some extent degeneracy from accepted standards, is not the most congenial task, but it is necessary that it should be essayed. In the first place the trouble has arisen not so much from carelessness as from want of knowledge, and the fact that only too many are carried away by false doctrines in respect of breeding for egg production. The one predominating idea has been to get somebody's much advertised super egg-laying strain, inbreed it, and get right on to Utopia. If breeding were so simple, then no skill

would be required to keep up a sequence of high production. The fact that a continuity of high production is seldom maintained is conclusive evidence of the necessity for skill in breeding, not only in respect of production, but for the maintenance of the breeds, without which there can be no standard of production.

Causes.

One of the principal causes of degeneracy from acquired standards is the failure to recognise the fact that all birds are not equally eligible for the breeding pen. Hence we find that instead of selections being made for breeding purposes, the whole of the stock on the farm are frequently used as breeders. Then again, even where this is not the case to the extent mentioned, there are invariably flock matings which contain extremely faulty specimens, particularly in the females. More care is usually exercised in the selection of the male side of the matings, but let no breeder deceive himself on this point; to use faulty females in the breeding pen—no matter how good the male may be—is sowing the seeds of future trouble. In other words, the faults or deficiencies in the females are not entirely overcome by good males; they will reappear in the second or third generation, if not in the one immediately following. A feature once introduced may be carried recessive in many of the progeny without any sign of it, but may eventually reassert itself. This is known as atavism. It is not my purpose to discuss this engrossing subject, but to touch upon it only to show the necessity for careful selection in order to preserve purity of breed together with its standard of production.

Matings.

If, as has been shown, all this can occur in ordinary matings of one male and the complement of females that go to make up what are known as single matings, what can be expected from flock matings composed of all birds representing the farm flocks—good, bad, and indifferent?

It is these flock matings that are responsible for pulling down the quality almost everywhere. Yet it is by way of day-old chickens bred from such that many farmers to-day are looking to improve their stock. Flock mating and the day-old chicken business have their place in the industry, but they can scarcely be regarded as means by which to improve our flocks.

The mating on farms which cater for quantity generally works out somewhat like this: (1) Selections for special breeding stock; (2) selections for stud bird sales; (3) flock matings to supply eggs and chickens. While the last-mentioned is fairly general practice it is not the way to breed high-class birds, either from a standard or egg-laying point of view.

There is a place in the industry for an increased number of stud farms devoted mainly to breeding high-class standard birds from which the lower order should be constantly recruited. Such farms are not likely to enter into the day-old chicken trade to any extent. There is of course a big demand for cheap stock; flock matings, low-grade eggs, and day-old chickens are the result.

Day-old Chickens.

The day-old chicken business has reached such dimensions that it is becoming a menace to the industry and the time has arrived, is in fact overdue, when some supervision should be exercised over hatcheries from which day-old chickens are supplied to the public. Every supplier of day-old chickens should be compelled to keep sufficient stock of a fair average quality to meet the incubator capacity on the farm.

In putting forward this view I am not advocating that hatcheries be compelled to keep stock right up to standard requirements for the breeds kept, but only that they should conform to a reasonable standard of physique and breed character—such, for instance, as would represent good flock average.

It is useless for the public to expect high-class breeding in chickens for which they pay 1s. to 1s. 3d. each; it simply cannot be done. But there is a big difference between what is legitimately possible and the class of chickens sometimes sold to farmers; chickens which have been hatched from eggs laid by immature, weedy, and often nondescript sorts, and eggs of the same character that are bought up at prices little above that of market rates.

The welfare of the industry is at stake, and it is for poultry-farmers to take some action to protect themselves from practices that can only result in profit to the few, and disaster to the many.

Unit Value of Fertilising Materials.

The unit values of fertilising ingredients in different manures for 1926 are as follows:—

	per unit.
Nitrogen in nitrates	21s. 11d.
,, ammonium salts	17s. 3d.
,, blood, bones, offal, &c.	17s. 7d.
Phosphoric acid in bones, offal, &c.	4s. 9d.
,, (water soluble) in superphosphate	5s. 11d.
Potash in sulphate of potash	6s. 8d.

To determine the value of any manure the percentage of each ingredient is multiplied by the unit value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, a bonedust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid :-

4	×	17s. 7d.	=	£3 10s. 4d.	= value of the nitrogen per ton.
20	×	4s. 9d.	=	£4 15s. 0d.	= ,, phosphoric acid per ton.
				£8 5s. 4d.	= value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is effected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail value of the manurial ingredients, and it will be found in the majority of cases the price asked and the value assigned are fairly close.—A. A. Ramsay, Chemist.

Orchard Notes.

July.

W. J. ALLEN and W. LE GAY BRERETON.

A Warning.

GROWERS who intend using any of the spray oils should first remove bandages placed as traps for codlin or peach tip moth. Otherwise the bandages may become soaked with the oil spray mixture and as the water evaporates the oil will become more concentrated and there is risk of serious injury to the underlying bark. Moreover, a bandage which has been soaked with an oil spray may possibly be a less attractive hiding place for grubs of the codlin or peach tip moth. When removing the bandages, all codlin or peach tip grubs found harbouring therein or on the bark beneath the bandage should be killed. A watch should be kept for any grubs that may drop to the ground while the bandage is being removed.

Though the search for and destruction of carry-over grubs in the packing house appointments, in cases, or in the trees can be delayed till later, if any slack time occurs it is well employed in this work, in order to lessen next season's infection.

Ploughing.

Most fruit districts have had ample rain during the autumn and early winter; in fact many growers will feel that they had too much, but even when this is the case the necessity for conserving as much moisture as possible for the coming season must not be overlooked. To this end ploughing should be completed this month; that is, of course, where the land is not too wet.

Where the land is carrying a crop, either weeds or a sown cover crop, this is most imperative, (1) because such a crop should be given time to rot, and thus yield plant-food for the trees when they start in spring; (2) because if the crop be left there is danger of it depleting the soil of much of the moisture stored in the soil, which will be required later for the trees when the dry spell comes. If the land was ploughed in the autumn (which is an admirable practice), and is growing little or no weeds and has not become compacted again since then, ploughing may of course, be safely delayed until later.

Pruning.

This work will still be engaging the time of many deciduous growers, especially growers of apples and pears, in the tableland districts. The new chum at this work should remember that usually apples and pears do not crop on the yearling shoot, except at the tip, when, as is often the case, it terminates in a fully developed fruit bud. It is therefore necessary to know how to deal with the laterals of the different varieties in order to encourage the development of fruit spurs in the most advantageous places upon the lateral.

Often a partial crop can be obtained from a tree earlier by leaving the aterals untopped and allowing the above-mentioned terminal fruit buds to develop fruit, but this practice should only be employed in the case of a variety such as Jonathan apple, which will not only crop at the tip, but will also develop fruit spurs along the lateral, leaving only a small portion at the base bare. The Granny Smith, on the other hand, cannot be relied upon to do this, and too many laterals, if left long, will only develop fruit spurs a short way behind the tip and the remainder towards the base will be bare. It is far better in this variety to sacrifice the cropping from the terminal bud by shortening the yearling lateral to about 3 to 4 inches in length. The results of the pruning plots, both in the north at Uralla and in the west at Orange, indicate that even a shorter cut would be advantageous, but it would be unwise to form a conclusion on only one season's results.

The yearling lateral of the Tasma can be dealt with in a similar manner to that of Granny Smith. The yearling lateral of Delicious can be dealt with in much the same way too, though the indications so far from the plots are that a shorter cut will be superior.

It is only exceptional for the yearling lateral of the Rome Beauty apple to spur if left uncut, nor can it be depended on to spur if cut back to 3 or 4 inches. The best treatment is to cut the yearling laterals back close to the dull eyes situated near the base. In strong trees shoots will arise again, often duplicating, and these in turn are treated in a similar manner, but are not thinned out; the sap in this way becomes divided and eventually only short fruiting shoots or spurs occur.

The yearling lateral of the Williams pear should be given from 2 to 3 inches. Some trees will form spurs on most laterals the second year; other trees take longer. Some seasons the yearling lateral will develop a number of fully developed spurs almost to their base; when this occurs of course they can be made use of by giving a little more length of wood.

The most satisfactory manner to deal with the yearling laterals of Beurre Bosc pear is to shorten them to the weak eyes quite close to the base. In a strong-growing tree many shoots will grow again before the following pruning season, and these should be treated in the same way, not thinning them out but allowing the duplication to divide up the sap.

Howell pear spurs readily, and in a young vigorous tree it is advisable to give more length, say about 6 or 7 inches, so as to increase the spurs rapidly; later, when the tree is well furnished with spurs the yearling laterals can be given less length, as it is only necessary to provide for renewals to take the place of old weak spurs.

The yearling lateral of the Packham's Triumph pear will develop spurs in a very similar manner to the Jonathan apple, and on strong trees on which it is desirable to increase the spur development rapidly, all the shorter yearling laterals may be left their full length. It will also spur when the yearling laterals are cut only leaving 5 or 6 inches.

Winter Cole pear will spur when the yearling lateral is shortened to within 2 or 3 inches, but on strong trees (which often occur) it may be desirable to leave some long laterals to take the growth. These of course can be shortened in later years. Both this variety and Winter Nelis spur readily, and their spurs rapidly duplicate, so that it soon becomes necessary to thin the spurs out severely.

Where short shoots occur about 2 inches long, terminated with a plump fruit bud, they can be left uncut in any of the above-mentioned varieties. They will generally fruit and form spurs just behind the original fruit bud.

Short two-year laterals on the above-mentioned varieties with the exception of Rome Beauty can be given a short extension. Longer two-year laterals should be cut just above the union with the yearling extension.

In those varieties where the yearling lateral is normally left full length, as in the Jonathan apple and Packham's Triumph pear, it may be necessary to shorten back to a spur if the fruit spurs are fully developed well towards the base. Care must be exercised, however, because sometimes the fully developed spurs that can be depended on to crop the following season are situated near the end of the two-year-old wood, in which case only the yearling extension should be removed, and further shortening delayed till later years when the spurs nearer the base have developed fully

The Removal of Large Limbs.

In the *Journal of Pomology and Horticultural Science*, vol. v, No. 2, March, 1926, there is a most interesting account of the research work of the healing of wounds in woody stems by Thomas Swarbrick, M.Sc., Department of Botany, University of Leeds.

It was shown that when a woody stem is severed, sooner or later the exposed surface is " blocked " to the entrance of moisture or germs by the deposit of a gum-like substance in the tissue slightly below the exposed surface, thus giving protection while the callousing process is going on. But more than this, when the wound is made during the period of active growth and of most active sap movement within the tissue (English season May to August) this " blocking " process is rapid and is completed in about four or five weeks. When the wound is made when active growth and sap movement is on the wane (English season September and October) the plugging is only partial, remains so throughout the winter, and only becomes completed in the following May (English season). With wounds made during the period from November to March (English season) no plugging takes place until early in the following May, when blocking is completed in from four to six weeks. When wounds are made in April (English season) the blocking process approaches that of the wounds made during the season of most active growth.

In the same number of the journal there is a report of the research of F. T. Brooks and W. C. Moore into the silver leaf disease of plums and apples, where it is shown that fresh infection by this disease through wounds made during June to August (English season) is almost nil; though this is probably partly due to the spores of the causal fungus being far less numerous during that period, it is quite reasonable to conclude that it is also greatly due to this comparatively rapid blocking which occurs in the wounds made at this period, because where such wounds were inoculated with spores of the fungus, only in a very few cases did the fungus develop and cause the disease. But similar inoculation of wounds made during the less active growing period resulted in a far higher percentage of successful infection.

From the foregoing it will be seen that our general practice of pruning deciduous fruit trees during the so-called dormant period exposes them for a long period to infection by many of those decay germs which exist at that period. This does not mean that we advocate carrying out the whole of the pruning operations during the growing period. There are two main reasons why this is not practicable. (1) Some of the pruning operations practised would have too stunting an effect on the growth of the tree if carried out during the period of active growth; (2) even if the stunting effect was not a barrier, it would not allow for the distribution of the work of the deciduous fruit grower throughout the year. His spring and summer months are already taken up with spraying, cultivation, and harvesting operations, and it would be most uneconomical to attempt to crowd in the pruning operations during this period.

However, it is well to avoid exposing wounds to infection for a long period, as far as is practicable. The period of liability to infection could be shortened by delaying the pruning till late in the winter. This is practicable where the area is small, but with larger areas, where the pruning is generally carried out by the regular hands during the whole of the slack winter period, it would need extra labour and consequently increased expense to push it through in a limited period at the end of winter.

It not infrequently occurs that after the framework of a tree has been established some of the main limbs are too crowded in places, which necessitates the removal of one or more. Very often even when the crowding is detected during pruning in the winter, no harm will be caused by delaying the cutting out till the following summer, and thereby taking advantage of the period when this blocking of the wound occurs most rapidly. This work can be done at odd times and thus need not interfere with the other summer work. There is another advantage in looking through the trees for overcrowding limbs during summer; it is easier then to decide whether a limb should be removed for this reason when the trees are in foliage. With trees that mature their fruit early it is possible to wait until the fruit is harvested before thinning. In fact for a long time past the Department has recommended doing this work on cherry trees either at picking time or soon after, though it was for other reasons, as the "blocking" process of wounds was not then known.

The objection to leaving this work in the case of trees that mature their fruits late is that if a limb that should be removed is carrying a good load of fruit, one is tempted not to sacrifice it.

Decay germs entering the stumps of large limbs that are cut back for grafting or budding is one of the great drawbacks to reworking old trees. Grafting cannot be delayed very much because of the difficulty of holding back the scions in the spring (cool storage might be a help in this respect), but the cutting back of trees in the spring to get a growth of young shoots could be delayed without any harm till the trees had made a slight shoot, and thus the vulnerable period of wounds to decay germs shortened to some extent. For the same reason the cutting back of the shoots to start the buds should be delayed till there is a slight shoot. This, too, for other reasons has previously been advocated by the Department. If when cutting back, stubs are left above the buds, the removal of these stubs too close to the inserted buds should not be carried out during the following winter but postponed till the active growing period.

It can be seen that the general practice of pruning citrus trees during the active growing period is perfectly sound from the point of view of natural protection of wounds from germ entry. Fortunately, it fits in well with the most convenient time for the citrus grower to carry out this work, as his busy harvesting season is from about June to Christmas, and the bulk of his spraying (or fumigation) does not start until February or later.

Paints for Covering Wounds.

The report referred to above does not indicate how permanent the blocking is. It seems reasonable to suppose that in wounds which subsequently show comparatively wide and deep cracks, the complete blocking would be destroyed. In any case wounds made in the winter are exposed for a long period, and even those made during the season of most active growth take from six to eight weeks to completely block, during which time they are liable to infection of decay germs. Hence it is important to paint all larger wounds that take several seasons to completely callous over; these should be repainted each pruning. It is not practicable, of course, to paint small wounds.

Pests and Diseases.

Woolly Aphis.—If spray oils or combinations of oil and nicotine extracts are to be used on apple trees for woolly aphis, preparation should be made to get it done before the buds are more than slightly swollen. The same applies to use of oil for San Jose scale on deciduous fruit trees.

Peach Leaf Curl.—This month is a good month to apply lime-sulphur, full winter strength, or Bordeaux mixture, 6–4–40, on peach and nectarine trees for peach-leaf curl, except very early blossomers, such as Edward VII and Bell's November, &c., which must be done at an earlier period.

The spray oil for green peach aphis can be applied before the buds are more than slightly swollen.

Cherry Black Aphis.—In districts where cherry trees were affected with this pest last season growers should not fail to spray with miscible spray oil diluted 1 to 20 of water by volume, just as the buds commence to swell.

Wind-loosened Trees.

Owing to the soft condition of the land from continuous rains in many districts, winds have loosened many trees and in some cases blown them right over. All such trees should be straightened up while the ground is still soft and the soil well rammed in round the roots close about the main stem. In the worst cases the trees will require support. Stakes or posts to act as supports should be amply stout and sunk into the ground sufficiently to make the trees secure till the roots become re-established; this may take three or four years. To relieve the strain it is often advantageous to head back the larger trees heavily.

When tying the trees to stakes or posts use a rope thick enough to stand the strain, and some padding, such as bagging, to avoid injury to the bark. It will be necessary to keep an eye on the trees or padding, and kill any pests, such as larvæ of codlin or peach tip moth.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society and Secretary.	Date.	
Peak Hill (T. Jackson) .. .	July	27, 28
Tullamore (C. S. Pryke)	Aug.	3, 4
Brisbane	,,	9 to 14
Trundle (H. E. Mullins) .. .	,,	10, 11
Condobolin	,,	17, 18
Gilgandra (D. Christie) . ..	,,	24, 25
Wagga (F. H. Croaker . .	,,	24, 25, 26
Bogan Gate (J. Egan)	,,	25
Cootamundra (W. W. Brunton)..	,,	31, Sept. 1
Grenfell (T. Wenham)	,,	31, ,, 1
Parkes (L. S. Seaborn)	,,	31, ,, 1
Junee (G. W. Scrivener)	Sept.	2, 3
Forbes (E. A Austen)	,,	7, 8
Coolamon (J. H. Seymour) .	,,	7, 8
Young (T. A. Tester)	,,	7, 8, 9
Gunnedah (M. C. Tweedie) ..	,,	7, 8, 9
Lake Cargelligo (J. Costella) ..	,,	8
Ganmain (C. C. Henderson) ..	,,	14, 15
West Wyalong (T. A. Smith) ..	,,	14, 15
Cowra (E. Todhunter) . ..	,,	14, 15
Manildra (J. Longley)	,,	14, 15
Singleton (S. Griffits)	,,	15 to 18
Melbourne	Sept.	16 to 25
Lockhart (E. D. Arnold)	,,	21, 22
Murrumburrah (W. Worner) ..	,,	21, 22
Canowindra (J. Rhue)	,,	21, 22
Temora (A. D. Ness)	,,	21, 22, 23
Boorowa (W. Thompson) ..	,,	22, 23
Henty (J. Lovell)	,,	28, 29
Barellan (J. Doherty)	,,	29
Barmedman (W. Pemberthy) ..	,,	29
Eugowra (F. E. Hill)	,,	29
Hillston (J. Pevers)	Oct.	1
Cudal (H. W. Ford)	,,	5, 6
Ardlethan (R. L. Neill)	,,	6
Quandialla (V. G. Talbot).. ..	,,	6
Hay (R. Eager)	,,	6, 7
Narrandera (W. H. Canton) ..	,,	12, 13
Ariah Park (J. McInness) ..	,,	13
Carcoar (J. Brady)..	,,	13
Griffith (M. E. Sellin)	,,	19, 20
Deniliquin (P. Fagan)	,,	19, 20
Lismore (H. Pritchard)	Nov.	16, 17, 18
Coramba (H. E. Hindmarsh) ..	,,	30, Dec. 1

1927.

Society and Secretary.	Date.	
Dapto (E. G. Coghlan)	Jan.	14, 15
Kiama (G. A. Somerville) ..	,,	25, 26
Tahmoor (E. S. Key)	Feb.	11, 12
Newcastle (E. J. Dann)	,,	15 to 19
Blacktown (J. McMurtrie) ..	,,	25, 26
West Maitland (M. A. Brown) ..	March	2 to 5
Moss Vale (W. Holt)	,,	3, 4, 5
Glen Innes (G. A. Priest).. ..	March	8, 9, 10
Taree (R. Plummer) .. .	,,	9, 10, 11
Campbelltown (W. N. Rudd ..	,,	25, 26
Camden (G. V. Sidman)	,,	31, Apl. 1, 2
Sydney Royal (G. C Somerville)..	April	11 to 20
Grafton (L. C. Lawson)	May	4, 5, 6, 7

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Agricultural Gazette of New South Wales.

Lameness in Lambs.

A REVIEW OF OUR PRESENT KNOWLEDGE.

H. R. SEDDON, D V.Sc., Director of Veterinary Research.

DURING the past year the occurrence of lameness in young sheep was brought to the notice of this station on several occasions. It has been found that the same cause does not operate in all cases, and though we are not yet able to state definitely just what causes may operate, sufficient information is available to warrant a preliminary account of the conditions. It is hoped, further, that the publication of this may induce other owners to bring before us other cases, in order that the various types of lameness may be thoroughly investigated and appropriate measures of treatment formulated.

Types of Lameness met with in Young Sheep.

Before discussing this in detail, it may be well to point out that lameness is not in itself a disease, but a symptom. Lameness is the manifestation of some structural or functional disorder of some part of the locomotory apparatus, characterised by a limping or halting gait. Briefly put, it may arise from mechanical injury to, or disease of, any of the structures of the limbs, and it follows, therefore, that there may be many different kinds of lameness in sheep, as in the horse. Probably the most common cause of lameness in sheep is some affection of the feet, such as foot-rot, and next most common we should expect some disease of the joints. The symptoms of the different types of lameness vary with the part affected.

We shall now consider the various types of lameness that have been met with.

1. Foot-rot.

This is a well-known condition, which affects the claws and the tissues at the junction of the digits. An account of the disease was given by Mr. C. L. O'Gorman, Senior Veterinary Surgeon, in the *Agricultural Gazette*, vol. 32, April, 1921, page 253.

Not only is foot-rot different from the other types of lameness to be described in that it affects the feet and produces very obvious lesions in that part of the limb, but the type of the lameness is quite different from those cases where the joints higher up the limb are involved. Further, the fore-limbs are more often affected than the hind.

The progress of the disease in the absence of proper treatment is well known, as is also the fact that heavy mortality may ensue if the animals are neglected.

Predisposing factors, such as softening of the horn, &c., by wet or swampy surroundings, excessive growth of horn, &c., play a leading part in determining this condition. The infection may be a mixed one by the

common pus-producing organisms, as in the non-contagious form, but where the disease affects many animals (so-called contagious form) and the lesions are severe the causal organism is *Bacillus necrophorus.*

2. Arthritis in Lambs (Inflammation of the Joints).

Lameness of this type has been found to affect animals of two distinct ages, and the disease may, therefore, be described under two headings, though possibly the same microbic cause is operating in each case.

(*a*) *Arthritis in lambs shortly after tailing, &c.*—In an outbreak reported by Mr. W. L. Hindmarsh, District Veterinary Officer, Armidale, the chief features were the following:—

The sheep in question were crossbreds, and in all twenty-four lambs out of about 120 were affected, though no deaths occurred. The lameness was first noticed a few days after tailing and castrating, and the first symptoms observed were that the lambs became lame, went off the mother's milk, and were obviously sick. The malady, however, lasted only a few days, when recovery set in. On examination of these recovering animals it was noted that they showed an enlargement of the joints, either the knee or hock, and in some cases both hocks or knees. On manipulation, however, little abnormality could be felt beyond some thickening of the tissues about the joint. There appeared to be no excess of fluid in the joint cavity.

Evidence of infection of the castration and tailing wounds was afforded by the presence of pus formation and discharge from tail wounds, enlargement of the end of the cord, and enlargement of the inguinal lymphatic glands.

This, together with the appearance of the lameness a few days after de-tailing, points very strongly to a bacterial cause, which, gaining entrance through the tail or scrotal wound, had reached the limb joints *via* the blood stream.

As the animals in question were obviously recovering, no material could be secured for bacteriological examination.

Prevention of this type of lameness is clearly possible by the application of an antiseptic dressing to tailing and marking wounds, and by the proper sterilisation of instruments.

(*b*) *Arthritis in Older Lambs.*—An opportunity has presented itself of investigating the occurrence of lameness in lambs about six months old, and as the cause has been definitely determined and the disease merits more extended description, a full account of it is given on another page of this issue of the *Agricultural Gazette.* (See "Lameness in Lambs due to a Bacterial Invasion of Limb Joints," H. R. Carne, B.V.Sc. page 575.)

A comparison of these two types of arthritis is interesting. In the first, the infection apparently gained entrance through operation wounds: in the second, however, such seems impossible, as the animals were of an average age of six months. In the latter case, however, the wool and skin

were heavily infested with grass seeds, and this at once suggests a possible means of entry for the causal organism. The question of lameness following grass-seed infestation will, however, be discussed more fully later.

In both cases, however, the parts chiefly affected were the hock and knee joints, and the lesions when examined some time after the onset of the conditions were comparatively insignificant, and consisted for the most part of simply a thickening of the tissue round about the joint. Mortality was nil, though in the case of the older lambs a number were killed, as they did not thrive.

The symptoms of this type of lameness are those which one would expect from a disease affecting the knee and hock joints, and are quite distinct from those of foot-rot.

Treatment of such animals is not likely to be of much avail, and if only a small percentage of animals become affected (as was the case in the outbreak in the older lambs) it would be hardly worth while attempting.

The causal organism appears to be one hitherto undescribed, but if on further investigation the disease should prove to be more extensive the use of a vaccine would seem to be indicated.

3. Lameness from Grass-seed Infestation.

As is well known, sheep badly infested in the wool with grass seeds often show an alteration in gait.

In this case the lameness varies from a stiffness of gait due to the great "mat" of seed in the wool interfering with the flexibility of the skin, to a distinctly painful type of lameness due to the penetration of the seeds through the skin, and the consequent irritation of the sensory structures of it. A marked "tenderness" in movement is frequently noted.

In addition, the animal at times shows a distinct lameness of one or more limbs. Such cases are probably often associated with a bacterial infection entering with the grass seeds, and an account of an outbreak where this occurred and symptoms of lameness were present in some of the animals is given in the present issue in a separate article by the writer and H. G. Belschner, District Veterinary Officer, Orange. (See page 569.) These cases have a microbic cause, but in the outbreak there reviewed the microbe was different from that of either of the forms above described, and proved to be the bacillus of Preisz-Nocard.

4. Lameness due to Blow Fly Attack.

As is well known, lambs are not infrequently attacked by the sheep blow-flies, which may "strike" an animal in some wound (*e.g.*, tailing or marking wound), or on some area where the skin has not been broken In the latter case a common situation is the crutch, and when that part is the site of an attack which has led to ulceration of the skin, or when the scrotum has been badly attacked, the pain consequent on movement causes the animal to exhibit a shuffling gait. In cases where the

attack is more to one side, the presence of the septic "maggoty" wound on the back or inside of a hind limb may cause the animal to favour that limb.

5. Obscure Lameness in Young Sheep.

A peculiar type of lameness was brought to our notice during the year, and though the cause remains obscure it is mentioned as evidence of the fact that we have yet more to learn of the cause of lameness in young sheep. In this case the affected animals were ram lambs, four to five months old. Only odd animals died from the condition, which, as a rule, lasted about three weeks, and was followed by complete recovery.

The symptoms, as described by Mr. H. G. Belschner, District Veterinary Officer, were as follows: —

"The affected rams exhibit lameness and some cases a general stiffness when walking, some lame in the forelegs, others in the hind legs. The animals become isolated from the rest of the mob, and are seen under trees and near logs lying down, sometimes at full stretch. In early stages they frequently get up and down, but as the condition becomes acute they remain in the recumbent position. The lameness has the appearance of being in the feet, and is very similar to that in sheep affected with foot-rot. Sheep sometimes carry a leg."

A number were examined carefully for foot-rot, but no signs of that disease were present. Constitutional symptoms, such as lacrymation, slight nasal discharge, and some degree of fever were present. On further examination, it was found that there was little to account for the lameness, a slight enlargement of the fetlock and some thickening of the skin over the knee from kneeling being all that could be detected. In an odd case pain was elicited on manipulation of the fetlock joint.

In an animal upon which we had the opportunity of making a post-mortem examination, no lesions could be detected beyond very slight lesions of arthritis in a fetlock joint, which during life appeared to be painful. No bacteria were found in any of the joints, and the lesion found was too small to account for the symptoms shown. The symptoms would indicate, however, that the lameness affected either the fetlock joint or the foot.

Though the cause was not determined, it is felt that possibly the cases were the same as those later described as arthritis (see heading No. 2), the failure to find the causal organism being due, perhaps, to the fact that the animal was recovering. At the same time, it should be pointed out that the joints affected are not the same, and further, that in addition to lameness the animals manifested constitutional symptoms.

Other Causes of Lameness.

In foals, and to a lesser extent in calves, it is not unusual for bacteria to gain entrance to the body through the navel before the umbilical cord has become detached, and in such cases the invading bacteria may gain

the limb joints, setting up an arthritis (*e.g.*, "joint ill" of foals). It would not be surprising, therefore, were a counterpart of this to be met with in young lambs, though such seems to be unknown.

But all disturbances of gait are not necessarily to be referred to bacterial agents. Certain plants have been found to cause quite well marked locomotory disturbances, though such perhaps would not come under the ordinary category of lameness. Examples of this are furnished by the Loco weeds of North America and the Darling pea and rough-bearded grass (*Echinopogon ovatus*).

What further investigation may bring to light is a matter of speculation.

Discussion.

From the foregoing it will be readily seen that we may include under the term lameness several quite distinct affections, different in cause, different in symptoms, and differing in the age of animals attacked.

Appropriate measures of prevention and treatment can be based only upon a full understanding of each condition, and upon accurate diagnosis in individual outbreaks. Much remains yet to be done, and the wholehearted co-operation of owners is sought in order that we may gain a full knowledge of the conditions, which may be briefly described as "Lameness in Lambs."

Potato Trials on the Lower North Coast.

The following tables show the yields in the potato trials, conducted on the property of Mr. J. Campbell, Wingham, and omitted from the report of the experiments in the Lower North Coast district published in the May *Gazette* :—

Variety Trial.			Fertiliser Trial.		
Variety.	Yield per acre.	Unmarketable.	Fertiliser per acre.	Yield per acre.	Unmarketable.
	t. c. q.	per cent.		t. c. q.	per cent.
Factor	8 8 3	16	No manure.	5 15 3	25
Carman No. 1 ...	7 2 1	10	3½ cwt. P.10*	7 9 1	30
Satisfaction ...	7 2 0	5	2 cwt. 3 q. 14 lb. P1* ...	7 2 1	28
Early Manhattan	5 15 3	9	2½ cwt. superphosphate....	6 9 2	14
Up-to-date , ...	5 15 3	25	2 cwt. 3 q. 14 lb. P2* ...	6 9 2	25
Early Rose ...	4 9 1	30	2¼ cwt. P7*	7 2 0	5

* P10] mixture consists of 10 parts of superphosphate and 1¼ parts each of sulphate of ammonia and sulphate of potash; P1 of 10 parts of superphosphate and 1¼ parts of sulphate of ammonia; P2 of 10 parts superphosphate, 1 part sulphate of ammonia and 1¼ parts sulphate of potash; and P7 of equal parts of superphosphate and bonedust.

The plots were sown on 19th August. Carman stood out for quality; Early Rose was very poor. There were a great number of small potatoes in the fertilised plots not included in the weights.—J. M. Pitt, Senior Agricultural Instructor.

Feeding Tests with Linseed and Cotton Seed Meals.

Trials were conducted at Berry Experiment Farm recently to determine the relative values of linseed and cotton seed meals as food for dairy cows. Two groups of six selected cows were fed as follows :—

	Group I.	Group II.
1st week ...	Ordinary ration	Ordinary ration.
2nd „ ...	Ordinary ration plus ½ lb. linseed...	Ordinary ration plus ½ lb. cotton seed.
3rd „ ...	„ „ 1½ lb. „ ...	„ „ 1½ lb. „
4th „ ...	„ „ 2½ lb. „ ...	„ „ 2½ lb. „
5th „ ...	„ „ „ „ ...	„ „ „ „
6th „ ...	„ „ „ „ ...	„ „ „ „
7th „ ...	Ration previously fed to Group 2...	Ration previously fed to Group 1.

The yields in milk and butter-fat of the two groups were as follows :—

	Group I.		Group II.	
	Milk. lb.	Butter-fat. lb.	Milk. lb.	Butter-fat. lb.
1st week ...	763	4·362	1,041·5	5·921
2nd „ ...	776	4·054	1,094	5·645
3rd „ ...	874·5	4·606	1,217·5	6·764
4th „ ...	892	4·782	1,223·5	6·578
5th „ ...	884	5·074	1,242·5	7·422
6th „ ...	829	4·824	1,238·5	7·065
7th „ ...	759·5	4·031	1,112·5	6·151

The results indicate that, taking into account their respective costs, the feed value of linseed meal and cotton seed meal are equal.— J. A. Robertson, Herdmaster.

The Limitations of Plant Analyses.

Too great importance is often attached to individual analyses of plants, without due regard being given as to the conditions under which the samples were taken. Soil conditions exert an immense influence on the feeding quality of plants grown on them. A sample of fodder grown on unmanured soil, or on virgin soil, would not stand comparison with a similar sample grown on well fertilised, cultivated soil adjacent to the first area from the point of view of feeding value judged by a chemical analysis. It would be distinctly misleading, therefore, to compare the feeding values of plants grown in different districts by the results of a chemical analysis unless all the conditions as to method of cultivation were given, or a large number of samples taken. Experience has shown that analyses are only useful when used for purposes of comparison between fodders that have been grown under similar conditions.—G. K. Baron-Hay, in the *Journal of the Department of Agriculture,* Western Australia.

Bacterial Infection Associated with Grass Seed Infestation in Sheep.

H. R. SEDDON, D.V.Sc., and H. G. BELSCHNER, B.V.Sc.

THE opportunity occurred to us to make a joint investigation of extensive losses in a flock, in which the cause was found to be infection by the bacillus of Preisz-Nocard.

This organism commonly produces abscesses in the body lymph glands of sheep, and has on other occasions been found to be the cause of abscesses in the subcutaneous tissue. It also not infrequently causes lesions of pleurisy and pneumonia, all types from acute to chronic being met with.

In the outbreak above referred to, however, there were three features in particular that render it worthy of extended description. These are, firstly, the severe losses, secondly, the association of infection with the presence of grass seeds, and, thirdly, the possible influence of dipping on the manifestation of lesions.

History.

The property, which is in the central western plains of this State, consists of about 8,000 acres and carries 5,400 sheep. It consists of good grass country watered by river and tanks. The pasture consists chiefly of corkscrew and barley grass, with some herbage.

All the sheep had been dipped about three weeks previous to our visit, an arsenical dip being employed. The losses had occurred among weaner sheep(five to eight months old), of which there were about 2,000 of mixed sexes, and about 200 had died, wethers predominating. The sheep were in fair condition.

Symptoms Observed.

Inquiry elicited the fact that about a week after dipping some of the weaners exhibited swelling inside the forearms, and lameness. Fourteen days later, sheep were seen lame, but showing no swelling. Certain sheep became cast on their side, and when placed on their feet showed no lameness. After being lifted up two or three times such animals eventually went down again and died. At the commencement of the trouble none of the swellings were opened up, but during the last week some had been so treated, the incision revealing little fluid, but a thick, dark red, gelatinous infiltration. Such cases also showed pus under the skin in other parts, *e.g*, along the sides, and it was noted that such was of a greenish colour. Some sheep exhibited swellings on the outside of the hind legs, and it was stated that these lived longer than the others. Like the others, the swelling

contained no pus and little fluid, but a blood-stained gelatinous infiltration. They were opened only in the later stages. No lameness had been manifested prior to dipping, when the weaners were stated to be in good condition, and the skin affected with grass seeds in varying degree from "slight" to "medium."

The Cases Seen.

A considerable proportion of the affected flock of weaners were seen, and it was observed that the sheep appeared dull and somewhat low in condition. A number of the more severely affected were caught and examined. Some were killed, and a few recently dead sheep were opened, the following notes being made on these:—

Sheep A.—Wether weaner, 7 months. Back arched, slight nasal discharge; left eye shows ophthalmia, scab 1½ inches below eye; grass seeds sticking through scab and greenish pus underneath. Killed. On skinning an abscess ¾ inch in diameter was found in the region of the hip. All abdominal organs appeared normal, except that the liver appeared somewhat fatty, and there was a moderate infestation of the abomasum with fine strongyles. Anterior lobe, portion of middle and posterior lobes of the right lung were red in colour and hepatised: interlobular septa distended with clear fluid. Abscess in anterior lobe involving pleural surface, with adhesions to costal pleura. A similar abscess in the posterior lobe, close to the surface of the lung, with roughening of pleura, but no actual adhesions. The greenish contents of one abscess showed through the surface. The left lung showed similar lesions, abscesses being present in both anterior and posterior lobes. Feet quite dry—no evidence of foot-rot. Left hip joint, membrane slightly congested. Both right and left prescapular lymphatic glands were enlarged, and the gland on the left was also oedematous.

Sheep B.—Ewe weaner, 8 months old, found dead. Swelling inside left forearm, which had been opened four or five days ago when it was said to have been as big as a man's fist. Now appeared an angry wound infested by maggots. Surrounding tissues showed extensive infiltration with sero-sanguineous oedema. Further examination not made.

Sheep C.—Wether weaner, about 8 months old, was seen exhibiting lameness, particularly of the right hind leg. Sheep wasting, walks carefully. Caught and examined, there was no external evidence as to cause of lameness: no foot-rot. Killed by bleeding. On skinning, gelatinous, straw-coloured fluid around right stifle, with increase of synovial fluid in the joint. Similar fluid was observed near the left stifle joint under the skin, over the external aspect of which were two abscesses the size of walnuts. Right shoulder, infiltration of tissue around shoulder joint by fluid, and extending down the muscle of the forearm. Some excess of fluid, partly coagulated, within the joint capsule and in the bicipital bursa. Right prescapular lymphatic gland enlarged and slightly congested. Left prepectoral lymphatic gland showed a small purulent area with some distension of the adjacent lymphatics. Left precrural lymphatic gland enlarged. Left axillary slightly enlarged. Abscess, size of walnut, just above point of left elbow. Several abscesses seen under the skin of different parts of the trunk. The lungs showed adhesions with the costal pleura, these being in the vicinity of numerous small abscesses. Early lesions of pyaemic nephritis.

Sheep D.—Found dead. Had been observed by the owner the day before. Skinned, two abscesses (one, size of walnut, other, size of marble) on lateral aspect of elbow. Badly seeded on outside of shoulder, with three small abscesses under the skin at this part. Brisket badly seeded. Abscess in left prepectoral lymphatic gland. On the right side, which was also badly seeded, there was an abscess on the outside of the elbow. Prescapular lymphatic gland enlarged, and showing haemorrhagic points. Badly seeded along floor of abdomen, with abscesses varying from walnut to marble in size along the sides. Lungs showed slight old standing pleurisy, and a few narrow streakish solid areas, probably early pneumonia. No gross lesions were detected in the abdominal cavity. A few fine strongyles in abomasum.

Sheep E.—Seen sick in paddock; slight frothy fluid from mouth. Easily caught. Temp. 106 deg. Fah. Killed and skinned. Not badly seeded. Small subcutaneous abscess left rump. Thoracic cavity—considerable pleural effusion with thickening of both costal and visceral pleurae and almost complete collapse of right lung. Fluid yellowish, slightly opaque, and containing many fibrinous flocculi. Odour sweetish. The left lung showed broncho-pneumonia of inferior third, with collapse at the free margin. Fibrinous false membrane over affected areas. Scattered areas of broncho-pneumonia in left posterior lobe. Kidneys showed parenchymatous nephritis, but other abdominal organs appeared normal.

The only lesion which was constantly observed in these sheep was the presence of abscesses involving the skin and subcutaneous tissues. These abscesses varied in size from a large-sized shot to as large as a tennis ball. The smaller were definitely associated with one or more grass seeds, which had penetrated the integument, and though such seeds were not demonstrated in all abscesses, their presence in all up to the size of a walnut indicates to us that these lesions were primarily due to infection brought about by the seeded condition of the skin. In certain parts there was considerable oedema, of a type which occurs in acute infections by the bacillus of Preisz-Nocard. Such oedematous lesions were more commonly observed in the region of the elbow and forearm in the anterior limb, and the hip and stifle in the posterior limb. The abscesses were likewise chiefly in the same situations and also over the ribs, particularly near the costal margins of the abdominal wall. In two cases the joints in the vicinity of this oedema were definitely involved. The lymphatic glands draining the limbs were more or less involved, the lesions varying from simple enlargement to oedematous and haemorrhagic glands. Pus was observed in two glands, both of which would drain parts involved in oedematous or pyogenic processes.

The next lesion to which reference should be made was the presence of abscesses in the lung. These were none of them very large, and none were well encapsuled, but consisted rather of purulent centres in pneumonic areas. These lesions were, particularly towards the periphery, distinctly croupous in nature. Coexistent with this was more or less exudation into the pleural sac, with the presence of fibrinous false membranes and frequently fibrinous adhesions. This type of lesion, viz., a plastic pleurisy with exudation into the sac and adhesion of opposing pleural surfaces over central purulent areas, has been not uncommonly observed by one of us (H.R.S.) in lambs slaughtered at abattoirs in Australia, and is, to our knowledge, a common cause of condemnation in New Zealand.

Abdominal lesions were remarkable by their absence, but early lesions of pyaemic nephritis were present in one animal.

Bacteriological Examination.

A complete bacteriological examination of the lesions was not made, but from such material as was collected the following was determined:—

Abscesses in or under skin.—Mixed organisms were present, these including small gram positive bacilli, coccobacilli, also some gram negative bacilli, and occasional cocci. Cultures sown with minimal quantities of pus gave pure growths of bacillus of Preisz-Nocard.

Oedema.—Showed no organisms microscopically, and no organisms were present in cultures made with the small quantities sown.

Pleural false membrane.—Showed small gram positive coccobacilli, which on culture proved to be bacillus of Preisz-Nocard.

Lung abscesses and pneumonic areas of lung showed a mixed infection, the predominating organism being the bacillus of Preisz-Nocard, but gram negative coccobacilli and some times a diplococcus were also present.

Discussion.

The pathological conditions found constitute a pyogenic infection with the bacillus of Preisz-Nocard, and it would seem that the march of events has been as follows:—

The infection was facilitated by the entrance of grass seeds. Lest it be thought that such is a common occurrence, we may mention that penetration of the skin of sheep by certain grass seeds is quite a common occurrence in parts of Australia, and has formed the subject of an article by Dodd (*Agricultural Gazette of N.S.W.*, vol. 30, 1919, page 255), who calls attention to the fact that, while they may occasion the animal considerable pain, in the majority of cases no suppuration at all is produced. He recalls, however, that at times numerous small subcutaneous abscesses may be found, and that in some cases the pus of the abscess is of a greenish colour, and appears to be due to the Preisz-Nocard bacillus. He also states that the seeds may at times penetrate the thorax or abdomen, setting up fatal pleurisy or peritonitis. While lesions were met in the chest in the cases recorded, they did not appear to have been due to conveyance of infection thereto by grass seeds, but rather by infection along the lymph stream.

In our opinion the lameness observed might in part have been due to pain occasioned by the presence of the seeds themselves, but the presence of an inflammatory exudate in and around certain limb joints, lymphatic glands, and muscles suggests that it was due to this latter. The general listlessness, weakness of the animals, and loss of condition might be explained by the painful nature of the malady and the toxic effects of the causal organism.

An interesting field for discussion is the possible influence of dipping. Some owners state that when sheep are badly seeded it is best to dip them or to swim them through a creek or river to loosen the seeds.

It is our opinion that in the outbreak under review the dipping can have had only a harmful influence, for we feel that the infection by the Preisz-Nocard bacillus was facilitated thereby. Dipping would cause the seeds to swell, and one can imagine that, were seeds part way through, the orifice in the skin would be thereby enlarged. Further, that the bacillus might easily exist in the substance of a swollen seed, whereas a hard, dry seed would be rapidly cleansed by the defensive forces of the body.

The simultaneous effect on a large number of animals shortly after dipping would indicate that the dipping was a contributing factor, though it should be pointed out that the seed infestation of the wool of the animals would likewise be simultaneous, and would occur about one to two weeks before dipping.

The fact that older sheep, also badly seeded and subjected to the same conditions, were not affected might be explained by the fact that weaners are invariably more severely infested than older sheep, are more severely affected when "seeded," and, further, that they are more susceptible to the bacillus of Preisz-Nocard, lesions of that organism being more severe in them than in grown sheep. Further, any lowering of general resistance by dipping might be presumed to be greater in weaners than in grown sheep.

Summary.

Severe losses in a flock of sheep following dipping are described. The lesions found were of a pyaemic nature, due chiefly to the bacillus of Preisz-Nocard, and it would appear that infection was brought about, or at least facilitated, by the act of dipping

Phosphatic Fertilisers as Manures for Grass Land.

Some farmers have an idea that the feeding of purchased fodders is a certain way of building up their land, and that the enhanced value of the animal manure will make up for any possible loss in the purchase of such fodders. Mr. A. B. Adams, Agricultural Adviser, Dairy Branch, Western Australia, discussing the subject in the *Journal of the Department of Agriculture* of that State, says: "There is sometimes a certain amount of truth in the contention, but usually it is far from the truth. It is particularly inaccurate when dealing with a soil that is naturally deficient in phosphates. On such soils it has been found that the use of phosphatic fertilisers is a more certain means of improvement, and, in many cases, shows a larger monetary return."

The writer shows the results of a ten years' experiment in which stock (cattle and sheep) were (1) fed on pasture manured with basic slag, (2) fed with cotton seed cake on similarly manured pasture, and (3) fed with cake on unmanured pasture. The average annual monetary gain was 48s. 11d. on the first-mentioned plot, as compared with a gain of only 18s. 3d. on plot 2, and a loss of 2s. 5d. on plot 3. With sheep alone in a different experiment, there was an average annual gain of 27s. 5d. with slag, and a loss of 11s. 9d. with cotton seed cake.

In interpreting the results, Mr. Adams says it is necessary to remember that they refer to stock on pasture sufficient for maintenance, and do not apply to a bare paddock. When feed is not sufficient for the stock at the time of the year when feed is scarce, if hand feeding is not directly profitable, it usually pays better than allowing stock to fall away in condition. Whether the feeding of concentrates is justified or not will depend on the conditions.

Time-of-ploughing Experiments with Early Maize.

The above experiment, commenced in 1923, was again planted at Grafton Experiment Farm during the season just past, the principal objects being to determine the increase in yield and the actual monetary gain due to early preparation of the land. The experiment as originally laid down provided for the individual plots to be ploughed during April, June, and August, but owing to the change of site, which during April, 1925, was occupied by a maize crop, it was not possible to plough the autumn crop until the last week of May. The ploughing of the June plot was accordingly delayed for about three weeks so as to permit of a more even distribution of time between the ploughings. In the ordinary course of events, about nine weeks separates each ploughing, whereas for this season only five and a half weeks separated the autumn and winter ploughed plots, and six and a half weeks the winter and spring plots. These alterations are reflected in the yields, the results being not so striking as in previous years.

The figures, nevertheless, emphasise again the value of early ploughing. The average acre yield of the May-ploughed plot was 82 bus. 13 lb., as compared with only 78 bus. 43 lb. from the June-ploughed plot and 75 bus. 22 lb. from that ploughed in August. In other words, with maize valued at 4s. 8d. per bushel, the value of the crop from the June and from the August-ploughed plots was 16s. 2d. and 31s. 11d. less respectively than that from the May-ploughed plot. To the credit of the August-ploughed plot, however, must be reckoned the sum of 10s. per acre, the cost of a second ploughing of the other two plots.—G. Nicholson, H.D.A., Experimentalist.

What Co-operation Cannot Do.

The possibilities and limitations of co-operative marketing are very generally misunderstood, writes Mr. H. E. Erdman, in a circular of the University of California College of Agriculture. In fact some of its limitations are often heralded as possibilities, whereas many of its possibilities are generally not appreciated at all. Three limitations are set out by the writer in particuar:—

1. Co-operative associations cannot arbitrarily "fix" prices, although they can and do exercise a favourable influence on prices.

2. Co-operative organisations cannot "eliminate the middleman," except in the sense of combining the function performed by a number of dealers at any given stage in the marketing process. What they really do is (*a*) to substitute a co-operative agency for a private, and (*b*) to combine a series of steps in the marketing process under one management.

3. Co-operative marketing cannot cut costs greatly. That is, a co-operative organisation cannot operate a given business unit any more cheaply than a private concern could operate the same unit. They may, however, cut their costs if they can increase the volume of business over that of the larger private dealers, or if they can operate as efficiently as the more efficient.

The value of a piece of equipment should never be measured by its price, but by what it will do, by what it will earn and save and make.

Lameness in Lambs due to a Bacterial Invasion of Limb Joints.

H. R. CARNE, B.V.Sc , Veterinary Research Officer.

A NUMBER of cases of lameness in lambs were reported in February, 1926, from a small property in the Coonamble district. Inquiry into the incidence of this condition elicited the following history.

The owner had been on the property for a number of years, and there had been cases of this complaint in lambs each year, but the number of affected animals had never exceeded ten annually, the property carrying from 700 to 1,000 breeding ewes. Lameness in the hind limbs was the main symptom observed; affected animals were lambs usually about six months old. These animals never did well, and on this account were usually killed. The class of country on which these sheep have been running is red loamy and chocolate soil, a little sandy in places.

Two affected lambs were forwarded to Glenfield Veterinary Research Station by Mr. Stock Inspector Ryan, early in March, 1926. These lambs had travelled 30 miles by road with fat sheep which were being trucked to the saleyards. Mr. Ryan noticed a decided improvement in one of these lambs on being rested in a paddock for ten days prior to being sent to Glenfield.

Symptoms.

On arrival at the Research Station the following symptoms were observed in the two lambs forwarded. Both were merino ewe lambs, about six months old and in poor condition.

Lamb 1.—When standing still, both hind limbs were kept far forward under the body, and on being viewed from behind the hocks were held much closer together than normal, the sheep appearing "cow hocked."

The gait showed a marked alteration from the normal, there being practically no flexion of the hocks, and as the limbs were advanced with each step, the toe of each hind limb was carried out sideways, describing a semicircle, the toe frequently scraping along the ground and resulting in considerable wearing of the toes of the hoofs.

Practically no lifting of the hind limbs in a vertical direction occurred, these being held stiffly extended throughout. When placed on its back on the ground this sheep had some difficulty in rising. The stifle joints appeared slightly enlarged when felt by hand, but the hocks appeared normal. When the sheep was placed on its back and passive movements of the limbs were made by hand, it was found that neither hock joint

could be as completely flexed as in a normal animal there being apparently some mechanical interference. Evidence of some pain was manifested during these manipulations.

The body temperature was 102 deg. Fah., and there was no evidence of any general disturbance, respiration and pulse being normal, and the animal took its food readily.

Lamb 2.—This animal presented much the same symptoms as No. 1, except that in this case there was stiffness of one hind limb only. A definite enlargement of the stifle and hock joints of this limb could be detected by manual examination, the enlargement appearing firm and not pitting on pressure.

After being kept under observation for some time, both animals were eventually killed and post-mortem examination made.

Post-mortem Examination.

All internal organs were normal in both cases. In the joints showing enlargement, the synovial fluid was little, if at all, increased in quantity, but was definitely cloudy. No alteration in the naked eye appearance of the synovial membranes or articular surfaces of the bones involved was observed. A thickening of fibrous tissue surrounding the joints appeared to be largely responsible for the enlargement of those joints noted in the living animal.

On splitting the long bones of the limbs, there appeared to be some congestion of the bone marrow at the ends of those bones involved in the affected joints. No gross lesions of the bones were detected after the soft tissues had been removed by boiling.

Synovial fluid taken from four joints in one and five in the other animal were found, on sowing on culture media, to contain a small bacillus in a state of purity. The organisms isolated from both lambs proved to be identical.

Pathogenicity Experiments.

A crossbred yearling lamb was inoculated intravenously with a small quantity of culture of the organism isolated from the lambs. This sheep showed a high temperature for several days and then became very lame, appearing to be sore in all its limbs. The lameness was at its worst about the sixth day after inoculation, then commenced to improve. On the eighteenth day the sheep appeared normal.

Conclusion.

From the above it will be seen that the cases, while definitely lame, presented no very extensive changes in the limbs, but what change was present was associated in each case with a bacillus with which we have been able to set up a similar train of symptoms. It would appear, therefore, that there is little doubt that this particular microbe is the cause of the lameness, and that it acts by producing arthritis.

The Newer Varieties of Wheat.

Descriptive Notes of a Few.

J. T. PRIDHAM, H.D.A., Plant Breeder.

THE many different conditions under which wheat is grown in New South Wales—differences of soil, of temperature, of length of season, of rainfall (in both amount and incidence)—have been responsible for the use of a large number of varieties with a wide range of characters. The necessity for the use of at least two or three varieties on every farm, so that the season's work may be distributed, and so that the possibility may be avoided of complete loss should the season fail to suit a particular variety, tends to add to the list, while the different purposes for which the crop is grown—grain only on thousands of acres, grain or hay as the season may dictate on many thousands more, hay only in some cases, and green feed in yet others—add complexity to the widely differing qualities that have to be satisfied to meet all conditions and requirements.

How many varieties are in use in the State it would be hard to say, but some idea is afforded when it is stated that, including those mentioned in the present series, the Department's current publications deal with something like fifty different wheats. To that must be added many which are used by farmers but which are not included in the Department's lists. The present writer on one occasion compiled a list of varieties that had been used in some way in the Department's plant-breeding work, and though by no means complete it comprised 450 varieties. As to those put before farmers, however, it is the continual effort of the Department to keep the number down to the minimum necessary to meet requirements.

The wheats now recommended by the Department are the product of systematic work spread over many years and still proceeding. New varieties, from whatever source they come—whether the result of the crossbreeding and selection by the Department's own officers or of workers in other countries—are continually being tested at the experiment farms, and if they appear promising after three or more years' trials, they are put into field variety tests.

Descriptions of the varieties recommended by the Department have been written up from time to time, and the current (fourth) edition of the "Farmers' Handbook" contains a statement of the pedigree and qualities of a number of the most useful, but within the last few years there has been a distinct advance, and descriptions of some of the new varieties that have done well in recent tests will perhaps be regarded as opportune, while remarks on some others can now be amplified or slightly varied.

It should be remembered that those described below *are not necessarily given a place* among the Department's recommendations, but that notes are

merely being furnished of certain wheats whose performances on the experiment farms and in a few cases on farmers' experiment plots have aroused interest in them.

Aussie.

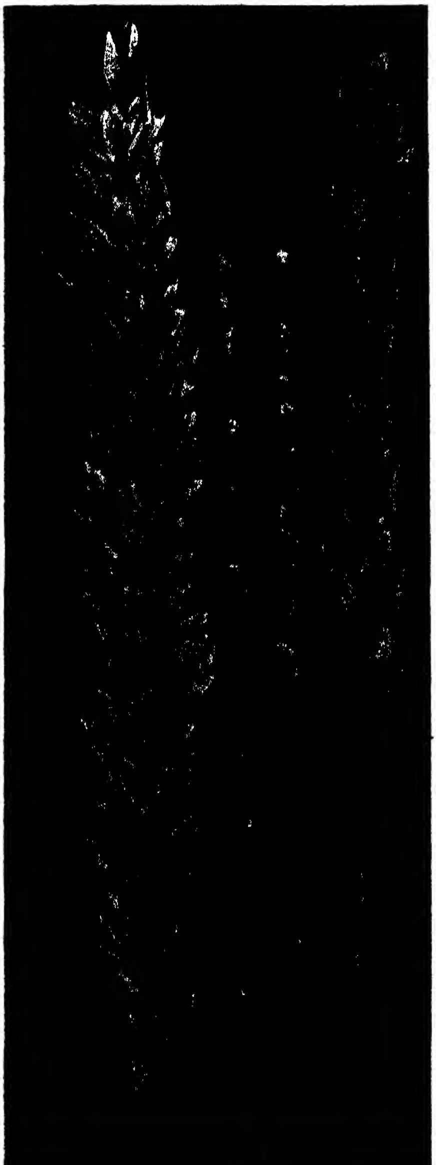
Aussie is an awnless variety with tapering white ears, and somewhat short and slender straw which is not purple and tends to be semi-solid. Aussie is grown in the North-west, and ripens with Bald Early and Gluyas, being a departmental crossbred between the latter variety and Federation. The grain is yellow, easy to thresh, and in the soft white class. The variety is more suited for grain than for hay.

Bald Early.

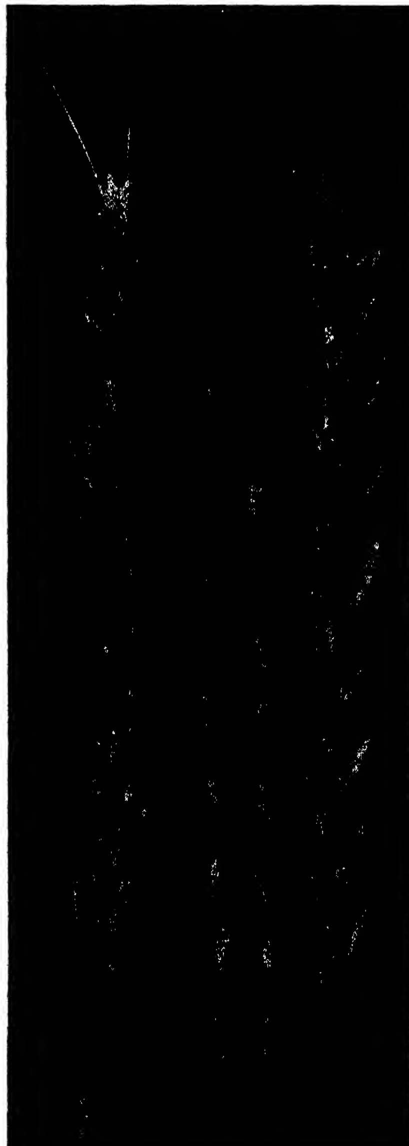
Barwang.

Bald Early.

Bald Early is a selection from Mr. Pye's Improved Steinwedel, ripening about the same time as Canberra, but having a better straw than that wheat, It has white, fairly close, tapering, and almost bald heads, with rather stout



Bena.



Binya.

straw, showing a purple tint. The grain, which is soft and white, is not inclined to shatter, and strips readily. It may be classed as a general purpose wheat

Barwang.

This is a natural crossbred from Hard Federation, with about the same season as that variety, but decidedly more rust resistant. Its white, tip-awned, tapering ear does not shatter, and the medium stout, white straw is strong and fairly tall. The variety is more adapted on the whole for hay than for grain, and suits the Tablelands. The grain is classed as soft to medium hard.

Baroota Wonder.

A farmer's selection from South Australia, Baroota Wonder is an early variety with the same season as Comeback. In parts of Riverina it is preferred for hay to Zealand and Firbank. The white, tapering, tip-awned ears are carried on fairly tall straw of good quality. The yellow grain is of average size, not hard to thresh, and is in the soft white class.

Bena.

Bena is a vigorous-growing variety, stooling moderately, with dark green, rather abundant foliage, and stout yellow straw of medium height. Maturing between Federation and Marshall's No. 3, it may be regarded as a mid-season wheat. Its large, brown, tip-awned heads give it a showy appearance, and having a strong constitution its yield is seldom disappointing. The large, attractive, yellow grain is medium hard in texture, with a fairly deep crease. Bena does not shatter, but threshes readily and stands drought well; it is apparently doing better in free-working soils than in stiff, moist clays. A selection made at Cowra from Hard Federation, its qualities point to its origin as a natural crossbred between that variety and Marshall's No 3. While not a disease-resistant variety, it is less liable to rust than Hard Federation.

Binya.

A natural crossbred discovered among plants of Hard Federation at Cowra Experiment Farm, Binya, has proved a very early wheat adapted for the western plains and dry country, coming into ear slightly before Clarendon. The tip-awned ear is brownish, of medium size, and holds its grain. The straw is fairly stout and not purple, stooling sparsely. The white grain is medium hard and of average size. Binya should rival Clarendon for inland dry districts, but it is not suitable for the coast.

Bobin.

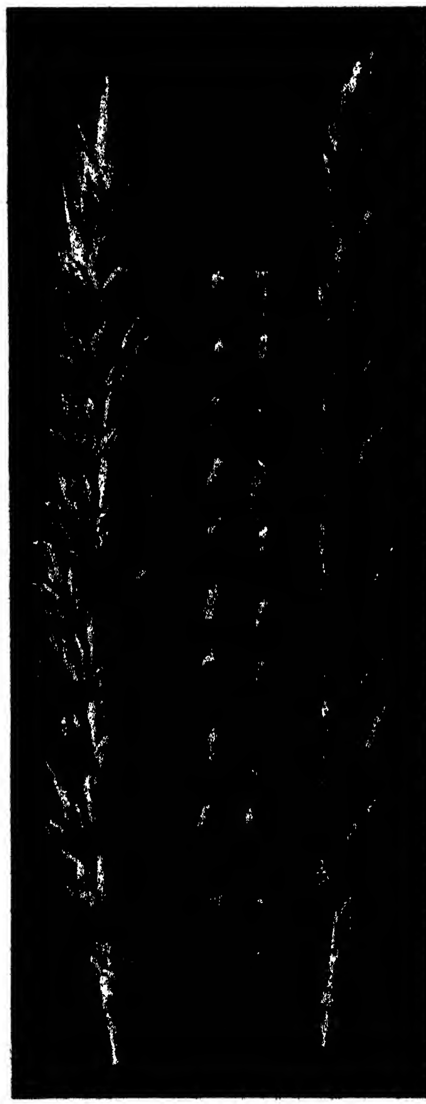
Bobin is a departmental crossbred between Thew and Steinwedel which ripens with Waratah. While escaping rust as a rule, it holds its grain satisfactorily, and is drought-resistant. The light brown, tapering head has strong tip-awns, and the spikelets are set rather irregularly on the stem.

Its straw is white, of very fair quality, and medium height. The white grain is somewhat large, soft, and has a fairly deep crease. The variety serves for either hay or grain in the drier districts.

Boolaroo.

The season of this variety is the same as that of Canberra, and like that wheat it is essentially a grain variety, the straw being short and not coarse, though fairly strong. It is rather rust and drought resistant, and likely to suit the North-west, being the result of crossing at Cowra a selection from

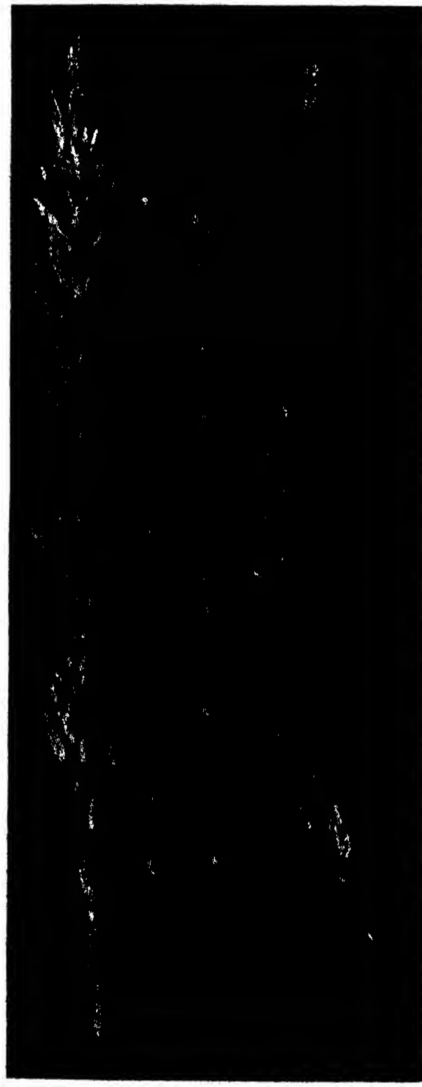
Bobin.



Boolaroo.

Hard Federation with Clarendon. The light brown ears are rather large and bold, with tip-awns and white grain of the medium hard class which strips readily.

Boonoo.



Cadia.

Boonoo.

Boonoo is a departmental crossbred ripening with Canberra, and is a general purpose wheat suitable for the warm dry areas, having done well at Condobolin. Boonoo has white, medium strong straw, the brown ear

showing strong tip-awns and tapering slightly. The long shaped white grain is in the soft white class, and is easy to strip. The pedigree is as follows:—

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                              Yandilla King  x  Zaff
                                       |__________|
                                             |
Steinwedel              x               Unnamed
     |_________________________________________|
                          |
                        Boonoo
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Cadia.

This variety grows rather tall, though the white straw is not coarse. It has a free-stooling habit with dark green, medium abundant foliage, and may be called a general purpose wheat. Cadia is adapted to the cooler districts of good rainfall, though it stands drought fairly well. Ripening about the same time as Yandilla King, it should be sown early. Its white, tip-awned, uniform heads are in some seasons inclined to shatter, like the old Purple Straw varieties, but it yields heavily, and (taking one year with another) there is very little loss. The bright yellow, flinty grain is medium hard in character, though of a mottled appearance in a wet year. Cadia is the result of a cross made at Lambrigg, the pedigree being as follows:—

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Cleveland  x  Talavera (LAT)      Jumbuck  x  9 (F)
    |______________|                  |___________|
           |                                |
       Unnamed                          Unnamed
           |________________________________|
                           |
                         Cadia
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The 9 (F) in the above pedigree is a crossbred of mainly Purple Straw breeding.

(*To be continued.*)

Flowering of Kikuyu Grass.

In the *Journal of the Department of Agriculture*, Western Australia, of last March, Mr. C. A. Gardner publishes a note on Kikuyu grass (*Pennisetum clandestinum*, Chiov.) having been found in flower at Inglewood, North Perth, and states that "this is the first record of the plant having flowered in this State, and perhaps the first record for Australia also." Mr. J. N. Whittet, Agrostologist of the New South Wales Department of Agriculture, points out that the first record of Kikuyu grass flowering in New South Wales is February, 1924, when specimens were collected at the Hurlstone Agricultural High School, Hurlstone Park, a suburb of Sydney. In February, 1925, flowering specimens of the grass were obtained from Wollongbar Experiment Farm, near Lismore, and from Ermington, near Ryde.

New South Wales Butter and its Improved Quality.

A. M. BROWN, Senior Dairy Instructor and Senior Grader.*

Early in the spring of the 1925-26 season, in a published review on the quality of the butter then being placed on the local market, it was forecasted that the coming season would see a further improvement in the quality of New South Wales butter, and this prediction has proved a correct one.

Legislation, reconstruction and re-equipment of factory premises, instruction, and (last but not least) co-ordination of effort between managers, producers, and the staff of the Dairy, Biological, and Chemist's Branches of the Department of Agriculture have combined to bring about this result.

Legislation has enforced the proper grading of cream, and has also given the Inspector, under the Dairy Industry Act, power, among other things, to order improvement to and reconstruction and re-equipment of dairy premises which are considered unsuitable for the purpose for which they are being used.

Reconstruction and Re-equipment.

Many factories have been reconstructed, and have thus been rendered more sanitary and suitable for the manufacture of pure food of good quality. In a number of cases, more efficient plant and up-to-date machinery have been installed, which have enabled a better and more economical treatment of the raw material, besides furnishing means whereby the different processes of manufacture, from pasteurising to churning, can be more satisfactorily carried on. Many instances of astonishing improvement in quality have been noted, coincident with re-equipment or reconstruction. The output of one factory had previously been of a very irregular grade, but after the premises had been re-equipped and reconstructed the butter produced there became one of the most sought after on the local market, and regularly grades 94 to 95 points. Another factory, after new machinery had been installed, improved its quality to such an extent as to be one of the leaders in the Continuous Grading Class at the last Royal Agricultural Society's show. Previously, this factory's output had been very indifferent in quality.

These are only two of many similar instances of splendid improvement which has taken place. There are still some factories where conditions and equipment preclude the manufacture of a high-class article, and where ineffective methods are being practised, all of which have adversely affected the quality of their output, but those in charge of these factories

* Paper read at the N.S.W. Co-operative Dairy Factory Managers and Secretaries' Association's Conference, Sydney, June, 1926.

are at last realising that, in order to compete successfully with other butters, they should instal machinery and adopt methods more suitable than those already in use for the production of a good article.

Instruction.

While it might appear that with the efficient grading of cream, and the reconstruction and re-equipment of factories, the scene has been set for the production of a "choicest" butter, these effects of legislation are in themselves insufficient to bring about the desired result, for, while farmers supply inferior cream, and wrong and careless methods are being applied at the factories, success cannot be hoped for, and it is here that instruction has played its part. Officers of the Dairy Branch have given much instruction to suppliers regarding the care of cream, and in over 80 per cent. of the cases where farmers have been visited for this purpose an improvement in cream quality from "second grade" to "choicest" has resulted. Many managers themselves have also done work in that direction with good results. Instructors have, in many instances, been enabled to suggest and demonstrate better and more up-to-date methods of manufacture which have proved successful, while the fact of these officers being in close touch with the butter graders in Sydney and the scientific staff of the Biological and Chemist's Branches of the Department has often enabled them to locate the cause of inferior quality butter, as indicated on copies of certificates, check-grading forms, letters, or biological examinations forwarded to them from headquarters.

Co-ordination of Effort.

Even when all the aforementioned factors have been applied in their entirety, there still remains something necessary to bring about the required uplift in quality, and that is, *a thorough co-ordination of effort* on the part of everyone connected with the industry. Harmonious relations should exist between managers, their boards of directors, and their suppliers; between the departmental staff, the managers, and the suppliers; and even between agents and their clients. Where these harmonious and friendly relations exist, a confidence in each other is created which is highly essential, and leads to friendly discussions and exchange of ideas, often culminating in something being done to uplift quality and improve the dairying industry as a whole. Competition between factories for cream supplies might often be eliminated by managers coming together in this way.

While there is still much to be accomplished in this regard, considerable progress has been made during the past season in the direction indicated. Numerous instances have occurred where the managers of factories have been communicated with by the Dairy Branch when graders have found the quality of the butter produced to be inferior, and suggestions have been made as to the cause and remedy, with the result that the managers themselves, or often in co-ordination with one of this Department's Dairy Instructors, have investigated along the lines indicated by these communications and have overcome the trouble. An acknowledgment of the help

given has often followed, showing a true spirit of co-ordination and friendly feeling. The help of the scientific staff of the Biological Branch has been availed of by factory managers and their suppliers on an increasing number of occasions. This assistance has been acknowledged, and has often been instrumental in solving many problems intimately connected with butter quality.

There is also abundant evidence that the co-operation of the Dairy Instructor is now sought more frequently than ever before, and farmers who are visited by departmental officers in connection with inferior cream receive the suggestions made in a more friendly spirit, and, on the whole, are found anxious to improve the quality of their supplies by following any instructions given.

Again, owing to an ever-increasing demand for a "choicest" grade article on the local market, as well as for butter bearing the "Kangaroo" brand in Great Britain, selling agents are more than ever anxious for an uplift in quality, and when they become aware of any inferiority, either from their own observations, or from complaints received from customers or through the graders, they appreciate any action taken to improve quality by the factory managers themselves or by the Department. More than ever before they realise that any attempt in this direction may indirectly help them in their business of distribution. Instances have occurred in which they have associated themselves with investigations carried on to improve quality. Agents have thus become units in the general scheme of co-ordination upon which so much of the success of dairying depends.

It will be seen that quite a considerable amount has been accomplished in the endeavour to lift the quality of New South Wales butter to a higher plane, and when those factories which are not yet equipped and constructed satisfactorily, and those few instances where thorough co-ordination is lacking, have come into line, the quality of the butter produced in this State should become more than ever a credit to all those connected with the industry, and should also be an example to producing centres of the dairying world of what can be accomplished by co-ordinated effort.

Information on Health and Disease in Live Stock.

In order that stockowners may obtain information rapidly when required, it is desired to point out that if such requests are forwarded through the correct departmental channels delay will be reduced to a minimum. Stockowners who wish for assistance or advice should communicate with the Inspector of Stock for the district in which they reside. If the question is of such a nature as to warrant it, the Inspector of Stock will make necessary arrangements for securing further investigation by the District Veterinary Officer, or (where there is not such an officer) directly by the headquarters of the Stock Branch. If information in pamphlet form on diseases is required, the Inspector of Stock, if he has not the required pamphlets, can immediately obtain them from headquarters.—Max Henry, Chief Veterinary Surgeon.

The Cheese Industry of New South Wales.

Some Aspects in 1926.

T. H. ATKINSON, H.D.A., N.D.D., Senior Dairy Instructor.*

The increasing amount of cheese imported in various forms over the past two years calls for inquiry as to the reason, and warrants some effort on the part of cheese manufacturers in this State to cater for the need which at present is being satisfied from overseas.

Cheese Imports.

For a considerable time, cheese of the blue veined type (Stilton) and the hard grating cheese (mainly Italian) have been imported in small quantities—a market of small dimensions but of growing importance—but this concerns us not so much as the increasing demand for Swiss Gruyere, put up in nicely wrapped segments in round cartons.

There are only two logical reasons for this popular demand:—

1. The quality, *i.e.*, its flavour, texture, and palatability, appeals to the public taste.
2. The package—size, shape, and covering—is convenient and saves waste.

In our opinion the quality of the cheese plays an important part, mainly from the point of view of uniformity, one segment of Gruyere being very similar to another in any consignment. Of perhaps greater importance is the type of package, which feature largely earns for Gruyere the popularity it enjoys.

The cheese is handled wholesale in tins and cases, and can be retailed in the smallest of segments with a minimum of effort in book-keeping and handling by wholesaler and retailer. There is no shrinkage or loss by damage of flies and mould; there is no cutting, loss in cutting, or even loss of time in wrapping the numerous ¼ lb. pieces demanded by the householder. The housewife has her point of view also, which was expressed by a conversation overheard in a cafe recently. It ran as follows:—In reply to the waitress's query, "Cheese, sir?" the gentleman said, "No, thank you," and turning to a lady next to him remarked that he was fond of cheese, but "one was never sure of what one would get, except that it was generally soft, tasteless stuff." This elicited the following reply:—"We like cheese also; I buy it now in little round boxes; it's cheaper because there is no waste. I pay 1s. 9d. for six pieces (½ lb.). When I bought ordinary cheese, a ½ lb. piece was put on the table for one meal, a small portion eaten, and after several days there was a dry hard piece remaining which had to be thrown out."

* Paper read at the N.S.W. Co-operative Dairy Factory Managers and Secretaries Association's Conference, Sydney, June, 1926.

Now note that lack of palatability and of uniformity of quality (not the lack of desire for cheese) were the factors responsible for non-consumption of cheese in the above case, and that saving of waste, due to the type of package, rather than economy in price, were the housekeeper's point of view. Herein lies the secret of success of the Gruyere segments. The wholesaler likes them because they can be handled without loss and with a minimum of effort. The retailer likes them for the same reasons. The consumer likes them because they are handy and economical, and the quality is what it is expected to be.

With Gruyere segments selling at 3s. 3d. per lb., and best local cheddar cheese at 1s. 2d. per lb. wholesale, or 1s. 6d. per lb. retail, we can presume that the price is of secondary consideration, though, everything else being equal, a lower figure would have a stimulating effect in the sale of these ready wrapped, good-keeping units of uniform quality.

There is no reason why New South Wales cheddar, which is made from pasteurised milk, is mild in flavour, and which could be of uniform quality, should not be put up in a similar way and command the market. The local cheese would have the additional advantage of the protective import duty of 2d. per lb. Machinery is available for the completing of all operations from the processing to the final labelling of this product.

Once again, let it be said that uniformly good quality cheese is essential. The variety of cheese (Gruyere or cheddar) does not matter much, but it must be true to label. The time is not far distant when all cheese will be manufactured or put up in a form suitable for retail distribution.

Other Varieties.

An 8 and 12 oz. cheese, not processed, of a type softer than cheddar cheese, is at present being made in Sydney and will be sold direct to the retail trade, wrapped suitably for protection from dirt and the heat of the weather, and bearing a label advertising its quality and identity.

Brick cheese, known by this name on account of its shape, is being made in New South Wales and will become popular for sale, particularly in the country. It can be put up very nicely in 3½ lb. blocks, and besides being palatable, is very convenient for cutting.

Mention might here be made of the numerous varieties of processed cheese being placed on the market under trade names, such as "Tenterfield," "Luncheon," "Rex," "Red Feather," "Burnbank," "Phœnix," "Khraft," etc., all of which are hard pressed cheese, with or without the addition of other substances, suitably selected, processed, packed, and labelled to meet the demands of a particular trade.

All these varieties are of advantage to the local cheese manufacturer, as the consumption is stimulated by their increased palatability and advertisement, provided always that the cheese utilised in the new form

is produced in New South Wales. It is doubtful whether much of our product is being utilised for the above purpose.

Cheddar Cheese Quality.

Our local cheese market has presented many phases in the past year, and deductions from them indicate clearly that something will have to be done in order to maintain a high standard of quality, increase the consumption thereby, and improve the average quality.

Under the present wholesale method of selling, it is doubtful whether it is profitable to make and sell the finest quality cheddar cheese, even at a premium of 1d. or 2d. per lb. on ordinary rates. The finest quality cheese has to be well made, with comparatively low moisture content, and cured for months, thus losing the advantages of up to 5 per cent. added water and of evaporation over the extra period of storage, and losing also the interest on the value of cheese over that period.

This commercial factor weighs very considerably with factory managers, and is a source of profit to the individual factory, but from the point of view of the cheese industry generally is detrimental, and is the cause of a falling off in consumption of our local cheese.

Our present day system is to manufacture a cheese of soft, soapy variety, of high moisture content, which will break down quickly and sell without much curing. The flavour under such conditions of manufacture is usually high acid or bitter, and anything but the mild, clean cheese flavour that is characteristic of good cheddar.

The public gets the blame for creating the demand for this cheese. Actually the manufacturer likes it because it is more profitable, and the grocer prefers it to the over acid, crumbly cheese (due to another extreme condition) because it is better cutting.

The public takes what it can get, reluctantly, as is indicated by the poor per capita cheese consumption of a little over 3 lb. per head of our population, and is buying green cheese and soapy cheese in the hope of striking the mild, mellow, meaty qualities of good old English cheddar. We strike it sometimes, but cannot trace it again, there being no identification mark.

The more or less necessary pandering of wholesale houses to the larger factories on account of keen competition, and their reluctance to encourage the improvement of quality of the smaller factories by obtaining a better price for improved quality, make it impossible to improve the situation by mere departmental instruction.

The system of selling must be altered. Cheese should be graded before sale and sold on grade. It should also be retailed on grade. Then, and then only, will the Dairy Instructor be able to preach the gospel of better quality and find disciples, because then he will have the weight of economic circumstance behind him. Then, too, the industry will flourish by virtue of increased consumption, due to better quality and the improved palatability of our cheese.

Field Investigations on "Slimy" Milk.

The significance of the cow's water supply in relation to the quality of its product is emphasised by recent field investigations on "slimy" milk. The investigation was undertaken by Mr. A. T. R. Brown, Senior Dairy Instructor, in connection with the inferior cream delivered to a South Coast butter factory during a dry spell last summer.

The cream was comparatively fresh and presented no off flavour or smell at the time of arrival at the butter factory; its consistency, however, was distinctly abnormal. The particles of fresh casein appeared to be particularly adhesive, and thus produced the slimy character in the cream, which on being touched with a stirring rod could be drawn out into very long threads. This cream was set aside together with other low-grade creams to be subsequently manufactured into low-grade butter. It was noticeable with a check sample which had been under observation for about forty-eight hours that the sliminess had diminished and a putrid odour had developed.

From inquiries made it was learned that at least two dairymen in the locality were troubled with this slimy condition in their cream at the same time These farms were visited and an endeavour was made to trace the source of trouble. The dairy buildings were well preserved and clean, while reasonable cleanliness was displayed in the treatment of all dairy utensils.

A sample of each cow's milk was then carefully collected into sterile vessels and kept under observation for a day. Several such milks showed the defect, and the responsible cows were sorted out and their milk kept away from the rest, but the cream from the herd still showed the defect.

It was observed, however, that on account of the prolonged dry weather, the once running freshwater creek which flows through these dairy farms had become a chain of pot-holes. Bacteriological examinations of water taken from the creek revealed the presence of large numbers of organisms which were capable of causing "ropiness" or "sliminess" when inoculated into sterile milk. It was observed that many of the milking herd on their way to the bails would wade into this stagnant water to drink, and in doing so gathered on their udders and other parts of their bodies millions of objectional bacteria which later found their way into the milk pails, where they would multiply rapidly and cause undesirable fermentation. One of the dairymen was fortunate in being able to remove his cattle to a better watered paddock, and was no longer troubled with "slimy" cream.

These results show the effect on the quality of both milk and cream of a stagnant water supply, especially one which is accessible to cows. Better results are obtained by troughing such water to minimise pollution and resultant infection.

Infectious Diseases Reported in June

The following outbreaks of the more important infectious diseases were reported during the month of June, 1926:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	6
Piroplasmosis (tick fever)...	Nil.
Swine Fever...	Nil.
Blackleg	2

—Max Henry, Chief Veterinary Surgeon.

Tomato Experiments, 1925-26.

Variety Trials and Work in Seed Selection.

A. J. PINN, H.D.A., Special Agricultural Instructor.

The cultivation of tomatoes—for the supply of factories for canning and pulping, as well as for the fresh fruit market—is yearly assuming greater importance in this State. The requirements for pulp making alone runs into many thousands of tons yearly.

In the production of fresh fruit for the market the early crop is of prime importance, inasmuch that the fruit from the crop not only supplies the requirements of the district in which it is grown, but also those of the cooler portions of the State, where conditions are unfavourable for early production. Early tomatoes are usually high priced, and the good monetary returns per acre which are always possible from the crop make it one worthy of much effort and attention on the part of the cultivator. The cultivation of this crop is essentially a " small man's " concern, experience soon demonstrating that only a small area can be cared for properly.

Proper attention to the preparation of the land, manuring, raising of plants, watering, staking, cultivation, spraying, pruning, tying, &c., is, of course, essential, but a suitable variety, and a high-yielding strain of that variety, must be selected if the returns are to be at all commensurate with the attention bestowed on the crop, and, with a view to securing even better strains of early varieties than are grown locally, a request for seed was recently addressed by the Department to the Department of Horticulture, Ontario Agricultural College, Canada. As a result, five samples were forwarded, consisting of three different strains of Earliana, one sample of a new variety resulting from a John Baer-Earliana cross, which was developed at the College, and one sample of Bonny Best. In commenting on this last variety, the Vegetable Extension Specialist stated that it was a special forcing strain, which was particularly good and well suited for their conditions. Of the three strains of Earliana, one (Moore's) was of Canadian origin, and the other two (J. B. Ricelo and Jos. Harris) were from the United States. It was noticed that the seed of the Canadian strain was of superior appearance to the other two, being of bright colour and plump in comparison with the dark coloured, small seed of the United States strains.

Seed of all varieties was forwarded in August, 1925, to the Hawkesbury Agricultural College and Bathurst Experiment Farm for trial. At Hawkesbury College the variety Earliana is the standard early sort, while at Bathurst Chalk's Early Jewel is favoured. The seed arrived too late for inclusion in the early plot at Hawkesbury College, hence proper comparison with the

local strain was not possible. Acclimatised seed will be utilised this year for trial with the local selection, but both the following reports on the varieties are of interest, even if only as indicating the apparent suitability of the strain of Bonny Best variety.

Hawkesbury Agricultural College.

The College orchardist (Mr. J. M. Arthur) has submitted the following particulars :—

The seed of the five varieties was sown on 24th August, and the plants put out in the field on 2nd October. In all instances the varieties were isolated in order to try and keep the seed pure.

Select Earliana (*Moore*).—First ripe fruit harvested 13th January. Heavy cropper. Plant strong grower, with large smooth fruit. This variety was superior to any of the other Earliana strains received from Canada.

Earliana (*J. B. Ricelo*).—First ripe fruit 29th December. Strong growth, fairly small fruit, moderately rough; medium cropper.

Earliana (*Jos. Harris*).—First ripe fruit harvested 13th January. Strong growth; smooth fruit of medium size. Fair crop.

John Baer-Earliana Cross.—The first planting of this variety was lost in one night through the tomato weevil, hence no data was obtained for comparison as to earliness, &c., with the other varieties, but with a later sowing it showed promise of being a good cropper of fair-sized smooth fruit.

Bonny Best.—First fruit ripened 4th January. Strong growth, heavy cropper; fairly large, smooth fruit, somewhat resembling Chalk's Early Jewel, and was certainly the pick of the five varieties.

Bathurst Experiment Farm.

The Experimentalist (Mr. R. Thomson) reports as under :—

The trial was carried out at the irrigation farm on an alluvial loam. The seed was sown in boxes on 12th September. Germination was good in all cases, and good sturdy plants were planted out as follows :—Bonny Best and Earliana (J. Harris), 12th November; John Baer-Earliana, Earliana (J. B. Ricelo), and Earliana (Moore), 18th November.

Growth was fair in all varieties. The season was very dry and the plants were not irrigated at all. Disease was not very prevalent. Spotted wilt was present to a slight extent in every case, and towards the end of the season all varieties showed slight signs of "rosette." The fruit produced was of good quality, although the early setting was somewhat scanty and small in size owing to the prolonged dry weather.

John Baer-Earliana.—Good vine growth, spreading, fairly dense, medium fine leaves. Flowered 30th January. Good setting of fruit (size, 1½ to 2½ inches), round, juicy, fair skin, small core, good flavour. Fairly good variety, but not likely to replace Chalk's Early Jewel.

Bonny Best.—Good vine growth, fairly dense, spreading; leaves average size. Flowered 25th January. Fruited earliest of any, and most prolific. Fruit 3 inches, round, even, and deep; very fleshy, firm thick flesh under skin, no core, very good sweet flavour. A very promising variety. Superior to Chalk's Early Jewel for packing.

Earliana (J. Harris).—Vines poor, little growth, upright, leaf fine. Sparse setting of fruit, and late. Fruit small (up to 1½ inches), round, soft and juicy, skin fairly thick, inclined to be pithy in centre. Flavour poor.

Earliana (J. B. Ricelo).—Average vine, fairly upright, medium open, medium leaf. Fair setting of fruit (1½ to 2 inches), round, inclined to be pointed. Fruit fairly firm, medium skin, large core, poor flavour. Not very attractive variety.

Earliana (Moore).—Fair vine growth, open spreading bushes, small leaf. Average setting of fruit, late, fruit 1½ inches, round. Soft thin skin, centre pithy, flavour very inferior. Very poor variety.

Of the above varieties Bonny Best stands alone. In production, quality, and packing qualifications it proved rather superior to Chalk's Early Jewel, and infinitely better than any other variety in the trial. None of the other varieties was very promising, all being much inferior to Chalk's Early Jewel in this season's trials.

Not a New Variety.

Bonny Best is not a new variety in this State, as it has been grown for many years by a limited number of growers. Mr. M. H. Purdue, New England Gardens, Glen Innes, has favoured this variety for some time. I saw the grower's last crop (1926 harvest), and was agreeably surprised at the high yield and the uniformly good quality. This variety is an improved strain of Chalk's Early Jewel. It has fruit which is borne in clusters, well coloured right up to stalk, and very free from core.

It is worthy of note that this Canadian strain of Bonny Best did well in both trial plots, and the results seem to bear out the report of the Vegetable Extension Specialist, who stated that the strain was particularly good. In view of the good reports, steps have been taken to grow locally seed from isolated plants in order that a larger supply of seed will be available, and also for the purpose of further selection.

Increased Yields through Selection.

Very interesting results have been obtained from the local selection of seed from imported varieties. Seed of the varieties Marvel, Norduke, and Norton were imported from the United States, and selections made at Hawkesbury College during the year 1924. The selected seed, as well as a small quantity of the original importation was sent to Bathurst Experiment Farm during the same year, and a quantity of each planted, from which seed was saved during 1925. From this acclimatised seed plants were again

raised in the spring and planted out on 18th November, 1925. The yields from comparable plots of an equal number of plants were taken, and are included in the following report from the Experimentalist, Bathurst Experiment Farm :—

Norduke (original).—Good average vine growth. Leaf fairly broad, early setting poor. Fruit 1½ to 2 inches, smooth, round. Very juicy, thin skin; no core, very good flavour, acid. Too late for local conditions; yield, 39 lb.

Norduke (H.A.C. Selection).—Small upright vine, medium leaf. Early setting poor. Fruit 3 inches, smooth, round. More fleshy than original strain; thin, soft skin, no core, mild flavour. Good variety, but too late; yield, 74 lb.

Norton (original).—Medium erect vine, broad leaf. Early setting fair. Fruit 3 inches, smooth, round, very good type, fleshy, fairly firm, thin skin, small core, acid flavour; yield, 65 lb.

Norton (H.A.C. Selection).—Good strong vine, coarser than Chalk's Early Jewell. Fairly compact, large leaf. Early setting rather poor. Fruit 3 inches, smooth, round, very good, fleshy, firm, thicker skin than original, pleasant acid flavour. A very promising variety; yield, 81 lb.

Marvel (original).—Average vine, medium erect growth, very leafy. Early setting rather poor. Fruit 1½ inches, smooth, round, very fleshy, firm good skin, dark red, sweet flavour; yield, 41 lb.

Marvel (H.A.C. Selection).—Vine similar to original. Early setting only fair. Fruit 2 to 3 inches, smooth, round, very fleshy, good firm skin, excellent flavour. A good packing variety. Yield, 68 lb

Growers Should Select.

The greatly increased yields of the selections in every instance indicate the possibilities of improvement in crop yield through selection, and suggest the necessity of every grower selecting sufficient good quality fruit for seed purposes from the most prolific plants each year. In view of the small quantity of seed required by the average grower, the reduction in the amount marketed would be of small consequence. In the case of early crops, the first ripe fruits, which are of high value, could be marketed and seed selected from the later formed fruits on selected plants.

Of the abovementioned three varieties, selection work will in future be focussed on Norton, as it is considered a desirable variety for the manufacture of tomato pulp, having the necessary qualities of colour and meatiness. In the first season's trials in this State the yield of the variety was rather poor, but improvement has taken place each year, and this season at Bathurst Experiment Farm it gave the highest yield in comparison with eleven other varieties, inclusive of such varieties as Harbinger, Burwood Prize, American Large Red, Pink Queen, and Helvetia.

In the United States the variety Stone was considered one of the most suitable varieties for manufacturing purposes, but was found to be rather susceptible to the Fusarium wilt (not to be confused with the "spotted wilt," so common of late years in local crops). Some wilt-resistant strains of this variety, however, were developed, one of which is the variety Norton referred to above.

Arrangements are now being made with a firm largely interested in the manufacture of tomato pulp to test out the yielding qualities of Norton in the district from which the firm's tomato supplies are largely drawn, with the ultimate object of being able to test out in fair quantity the suitability of the variety in regard to high yield and quality of pulp.

Varieties from Queensland.

Following upon a favourable report in the *Queensland Agricultural Journal* of March, 1925, in regard to varieties of tomato grown in the Bowen district, seed of two varieties, viz., Bowen Buckeye and Roselawn Buckeye, was secured. The varieties were described as follows:—

"Bowen Buckeye.—A prime favourite of the Bowen growers to the extent of over 90 per cent. of the crop grown. In the Northern Division it has proved itself over all varieties as the heaviest cropper in all districts from Bowen to Burketown, and seems well suited to warm conditions . . . Grown in the comparatively dry climate of Bowen, it stands shipment very well, but possibly would not do so well if grown under humid conditions.

"Roselawn Buckeye.—A sport from Bowen Buckeye, which it greatly resembles in growth, and on which it is an improvement in size and solidity of fruit."

Seed of both varieties was forwarded for trial to Hawkesbury Agricultural College and Bathurst Experiment Farm, also to growers in the Penrith, Dubbo, Bellingen, and Metropolitan districts.

The season in practically all localities was one of the driest and hottest on record, and in view of the suitability of the varieties to Queensland conditions, it was thought that the varieties would probably do well in comparison with varieties usually grown here. On the contrary, however, the reports are in all cases unfavourable, but further small trials will be made next season.

At Hawkesbury College the two varieties were tested in the early as well as the late plots, and in both instances produced very light crops. In the early plot they were pruned similarly to Earliana (the standard early variety), and bore practically no fruit, and in the late bed (unpruned) also they bore an exceptionally light crop. One point in their favour at both periods was that they appeared immune to wilt, all other varieties in their vicinity being in most instances badly affected.

The report from Bathurst Experiment Farm stated that the vine growth was exceedingly prolific. The plants spread to about 6 feet across, and grew 3 feet high. No Fusarium wilt appeared, but two cases of spotted wilt

were noticed in each variety. Bowen Buckeye did not grow quite so vigorously as Roselawn Buckeye. The setting of fruit was extremely late, and then only very light. The fruit was irregular in shape, measured about 3 inches, and had fairly thick skin, very large core, and an insipid flavour. On this year's results both varieties are very poor from every point of view.

At Dubbo planting was somewhat late, and both varieties were late in maturing, and failed to produce marketable fruit. This failure was thought to be largely due to the very dry time experienced during the growing season. From a disease-resisting point of view each variety showed promise. Only one plant of Bowen Buckeye was infected with "rosette," all other plants being free from disease. "Rosette" was particularly bad throughout the whole district.

At Penrith the season was one of the worst in the history of the district. Mr. J. Carter, with whom the trials were carried out, raised very good plants, and considering the weather conditions prevailing, obtained a fair stand in the field. Spotted wilt made its appearance soon after transplanting, and about 95 per cent. of the plants were infected. All varieties were susceptible to this trouble, the two Queensland varieties being as bad in this respect as the June Pink variety, which was grown alongside. The crop was practically a failure.

Reports from Bellingen and other centres were all to the effect that the varieties had done poorly.

Tubercle-free Herds.

The following herds of cattle have been submitted to the tuberculin test by Government Veterinary Officers or approved veterinary surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd:—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
Department of Education .	Eastwood Home .	......	10	7 Oct., 1926.
Do do ...	Hurlstone Agricultural High School.	......	47	23 Nov., 1926.
Do do ...	May Villa Homes ...	......	6	8 Jan., 1927.
Do do ...	Yanco Agricultural High School.	......	29	14 Jan., 1927.
Walter Burke	Bellefaire Stud Farm, Appin	Jersey..	36	19 March, 1927.
Department of Education ...	Gosford Farm Home	......	32	16 April, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
Department of Education ...	Mittagong Farm Homes.	......	33	7 July, 1927.

—Max Henry, Chief Veterinary Surgeon.

Maize at the R.A.S. Show, 1926.

THE SEED EAR CLASSES.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

It is not so many years since the exhibit of maize at the Royal Agricultural Show was consistently made mostly by one or two men, who carried off most of the prize money. No recognised named varieties existed, and the exhibit was of practically no educational value and a positive reflection on what is the crop of second importance in the State.

At the recent show there were 108 exhibits in the various seed ear classes, and the section has also made very marked and consistent improvement in recent years in quality. With classes for named varieties, and with extremely keen competition by a large and increasing number of farmers who are also eager students in seed selection, the section has been lifted to a high and useful plane, which is not only of great educational value, but which also makes a great display, epitomising in a large measure the maize-growing resources of the State.

The classes have largely been arranged with this definite object—the chief varieties grown in or specially suited to different parts of the State constituting the main classes.

Although some important maize-growing centres in New South Wales are not yet represented in this section, it is thought that this will only be a question of time. It is impossible to pass over the rise of the Manning River into prominence in the "maize-growing world" of the State. Farmers there know varieties, and study type and seed selection generally far better than in any other district in the State. And this study has gone hand in hand with progress in other phases of maize-growing, until that river may be regarded as the most up-to-date and progressive maize-growing centre in New South Wales. This was to some extent borne out at the recent Easter show, when out of thirty-one prizes in the seed ear classes, twenty-three went to Manning River growers. These farmers are finding that not only is the business attended with honor and remuneration from the prizes, but that the remuneration is increased by the demand they get for seed, which they are able to sell at enhanced prices.

It is this phase (together with the accompanying benefits derived by a farmer from his own maize crops as a result of a closer and more systematic study of type and seed selection, induced by exhibiting at the show) that will make its appeal in time to farmers in many other maize-growing centres. There are distinct signs of this extension already, but new exhibitors must make rapid progress to reach the high standard which the Manning River growers are now attaining with their maize.

In order to give some other districts a better chance and a better idea of competing in this maize section, it is intended here to briefly review some of the classes at the recent show and to illustrate some of the winning exhibits.

In the Fitzroy class, the competition improved considerably this year. More competitors got closer to type, but some yet need to learn that evenness in size and shape of ears is a valuable show characteristic, which brings out the winner when other things are equal or nearly so. This is probably the most popular variety of maize in the State to-day, being grown and recommended as a high-yielding variety on practically the whole length of the coast. It has always been largely grown on the Clarence and Richmond (though no entry from either of those rivers is ever seen), but although comparatively unknown on the Manning and Macleay a few years ago, it now has a strong hold on these rivers, particularly on the Manning.

A better type and quality is being shown now in Large Red Hogan than in former years, but there is room for much improvement still. There probably always will be room for improvement in this class, especially as to uniformity in colour, for it is certainly difficult to get uniform colour and type in this variety. The type favoured for seed and for show is a bright grain of medium red colour (neither too dark nor too light), and a smooth rather than a rough dent. Second prize in this class was awarded to an exhibit which was a rougher dented type and slightly darker colour than the standard type, but which could not be passed over on account of its excellent uniformity in all respects—size and shape of ear, colour, dent, shape and width of grain, &c. It indicated extreme and painstaking care in selection, which (if applied to a more desirable type) would have stood alone in this class.

Large Red Hogan is a variety which is suited best to Central and South Coast conditions. A few years ago it was grown almost exclusively on the Hawkesbury and Hunter Rivers, but it has extended to the Manning and Macleay by reason of its high and consistent yields in variety tests there. A few new exhibitors were noticed in this class, but they mostly made the mistake of sending in cobs which were very large, but which were altogether too variable in colour of grain. Some of the old competitors are getting too far in the desire to get a bright coloured grain—the cobs having too few rows with wide furrows and an objectionable roundness in the shape of the grain.

Leaming is improving in type every year—most of the competitors following the improved type which has been produced by the Department of Agriculture in its breeding work at Grafton Experiment Farm. This type is a distinct improvement on the long eared, wide furrowed, shallow, dark red grained type, which a few years ago was (and still is in some quarters) the vogue amongst many farmers on the Clarence. It is largely grown on the Clarence and Richmond as an early variety, but many growers on these rivers have adopted and have stuck to the bad type referred to. They would be

really surprised to see the improvement in this variety as exemplified by the keener Manning River growers at the R. A. Show. No exhibits ever come from the Clarence and Richmond—may be because the farmers there confess their inferiority in the matter of seed selection. A new exhibitor from the Manning beat all the old hands in this and in the Golden Beauty class—a praiseworthy performance.

The Golden Beauty class is becoming yearly more and more keenly contested. Manning River growers know this variety better than any other, and grow it to as near perfection as it is possible to grow a variety of maize. The variety is also making headway on the Macleay River, where some fine samples were seen at the local show this year. One of the local prizewinners at Kempsey tried out in the Royal field this year, and he surpassed all the Manning growers in quality, but spoiled his exhibit completely by unevenness.

If the Macleay River growers were at all alive to the honor and reward of winning a prize for maize at the Royal show, almost any of them would stand an excellent chance in the Golden Superb class. This variety is extremely popular on the Macleay, practically every farmer having an area planted with it as an early sort. Having been grown and handled for so many years there, Macleay farmers know the type well and should be able to beat any of the Manning growers, who suffer greatly on account of their lack of experience with this variety, and never seem to be able to put forward a good sample at the Royal. Yet the competition was again restricted this year to Manning River growers—not a single entry coming from the Macleay.

Funk's Yellow Dent is a variety which has shown very marked inprovement at the Royal. Although it sometimes does well on the Central Coast as an early variety, it seems better suited to the South Coast, or to the western slopes. The class is a chance for the South Coast farmer, or for Inverell, Gundagai, or Tumut maize growers to win a prize, and the honor this year went not unexpectedly to a veteran Tumut grower.

Early Clarence is a variety which naturally restricts itself for show purposes to rich alluvial soils on the western slopes, and the aforesaid Tumut grower had no difficulty in carrying off the first prize.

Pride of Hawkesbury was at one time grown only on the Hawkesbury River, and it has always excited attention at Sydney show by reason of its very large cobs. When shown by growers from the Hawkesbury it was never very uniform in type, but the Manning growers have improved it out of recognition in this respect. Not only that, but with its improvement in type and uniformity (and also in soundness and freedom from disease) it has steadily gained in yielding capacity until last season it won the yield contest against all varieties on the Manning River. This is a pleasing culmination to the improvement effected in selection in a high show standard, and is a further proof of the excellent value of the R.A.S. maize section, now that it has been put on a proper basis.

In the class for "Any other yellow variety," some very good maize o Large Yellow Horsetooth, Manning Pride and Glittering Gold (a cross between Early Clarence and Funk's Yellow Dent) is usually seen. Coodra Vale and Hawkesbury Hogan are other varieties which competitors might well consider for this class.

A falling off in the number of entries in the Hickory King class took place this year, but the first prize exhibit from the Manning River was the best sample which has ever been displayed at this show.

The Iowa Silvermine class is intended to bring exhibitors from the South Coast and the western slopes, where this variety grows very well. North Coast growers do not fare so well with it as a rule, and moreover do not select it well to type, getting more or less confused with the other local types of Silvermine.

The chance for these latter types is in the "Any other white class," where Craig Mitchell and Giant White are also worth consideration by intending competitors.

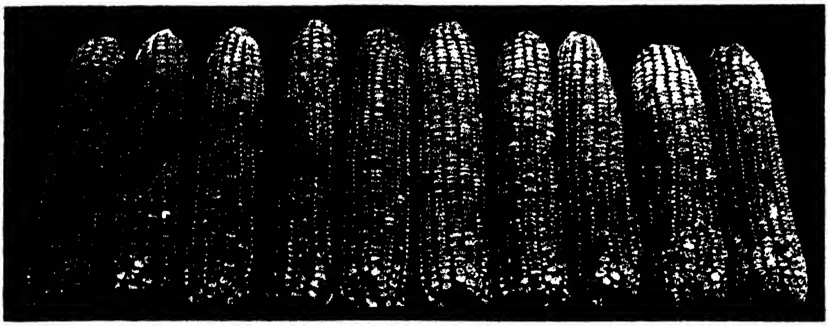
The sweet corn class has received little support recently, and its elimination is being recommended to the Society.

The popcorn class is falling off a little, but may pick up somewhat with the recent fillip given to the growing of this corn on a commercial scale. While there is a good market for it, its retention on the schedule is of educational value—many visitors to Sydney show seeing it for the first time there.

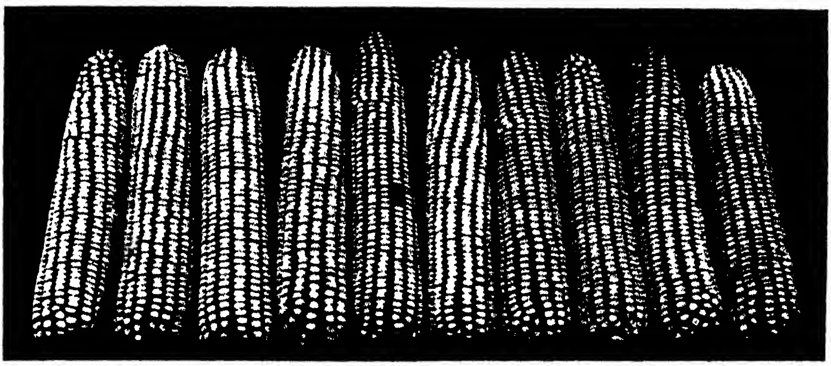
The championship class, judged on points which are exhibited on cards for the competitors' guidance, proved as popular as ever, and an alteration in the system of awarding the prize money had the effect of improving the quality in this class. A further alteration in giving set prizes for the first five places, instead of dividing the prize money *pro rata* on the points scored, should have the effect of still further improving the quality in this class. Only one exhibit per competitor should be allowed in this class, instead of two entries of different varieties. Each competitor knows fairly well which is his best exhibit, and his second exhibit (which is entered with the hope of picking up place money) has the effect of lowering the quality in the class and of starving other classes in which the second exhibit might have been entered.

The winner of this class thoroughly deserved his success with the Funk's Yellow Dent entered. But for losing several points on account of not being quite dry, it would have scored nearly the possible. This is the first time Funk's Yellow Dent has won the championship, and strangely enough the second place was also filled by an entry of the same variety. It is coming to be recognised as a good show maize, if care is taken in the selection of ears.

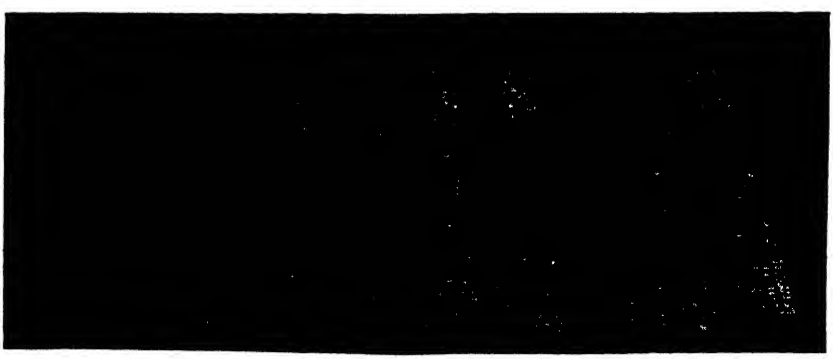
The awards in the seed ear classes are given below. The publication of these in the *Agricultural Gazette* with the addresses of the prize-winners needs no apology, since it is becoming clear that the maize schedule at the R.A.S.



First Prize Exhibit in Class for ten Ears (Fitzroy).



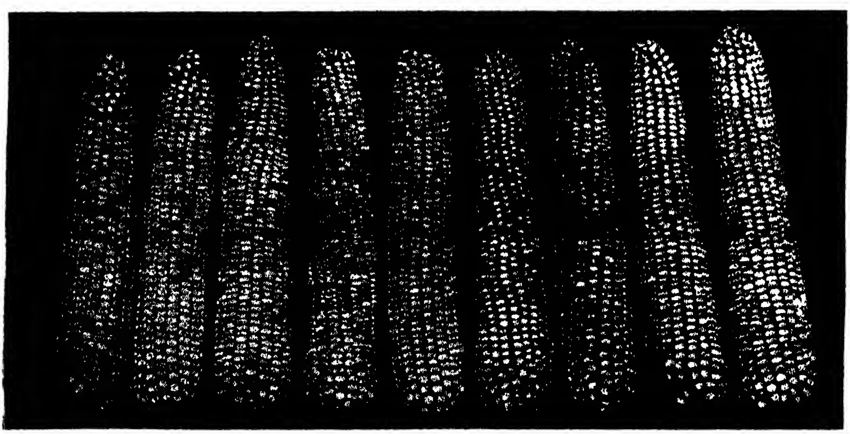
First Prize Exhibit in Class for ten Ears (Large Red Hogan).



First Prize Exhibit in Class for ten Ears (Leaming).

WINNING EXHIBITS IN THE MAIZE SEED EAR CLASSES, R.A.S SHOW, 1926.

First Prize Exhibit in Class for ten Ears (Golden Beauty).



First Prize in Championship Class for any Variety (Funk's Yellow Dent).

WINNING EXHIBITS IN THE MAIZE SEED EAR CLASSES, R.A.S. SHOW, 1926.

is bound up intimately with the Departmental work in developing and improving the maize varieties of the State. The prizes in the following classes were first £3, second £1 in each case, except the championship.

MAIZE EARS FOR SEED.

Class 1234.—Fitzroy, ten ears—S. Flett, Taree, Manning River, 1; J. C. Stitt, Taree, Manning River, 2.

Class 1235.—Large Red Hogan, ten ears—J. G. Stitt, Taree, Manning River, 1; S. Flett, Taree, Manning River, 2.

Class 1236.—Leaming, ten ears—S. Ladd, Glenthorne, Manning River, 1; S. Flett, Taree, Manning River, 2.

Class 1237.—Golden Beauty, ten ears—S. Ladd, Glenthorne, Manning River, 1; S. Flett, Taree, Manning River, 2.

Class 1238.—Golden Superb, ten ears.—J. G. Stitt, Taree, Manning River, 1; J. C. Stitt, Taree, Manning River, 2.

Class 1239.—Funk's Yellow Dent, ten ears—J. T. Callaway, Gilmore, Tumut district, 1; J. C. Stitt, Taree, Manning River, 2.

Class 1240.—Early Clarence, ten ears—J. T. Callaway, Gilmore, Tumut district, 1. No second prize awarded.

Class 1241.—Pride of Hawkesbury, ten ears—J. G. Stitt, Taree, Manning River, 1; S. Flett, Taree, Manning River, 2.

Class 1242.—Any other yellow variety, ten ears—S. Flett, Taree, Manning River (Large Yellow Horsetooth), 1; E. Hargreaves, Wagragobilly, Tumut district (Glittering Gold), 2.

Class 1243.—Hickory King, ten ears—A. Abbott, Killawarra, Manning River, 1: C. E. Drury, Glenthorne, Manning River, 2.

Class 1244.—Iowa Silvermine, ten ears—A. Abbott, Killawarra, Manning River, 1; J. T. Callaway, Gilmore, Tumut district, 2.

Class 1245.—Any other white variety, ten ears—A. Abbott, Killawarra, Manning River (Manning Silvermine), 1; C. E. Drury, Glenthorne, Manning River (Manning White), 2.

Class 1246.—Sweet corn, ten ears—T. J. H. Kelly, Tango P.O., *via* Bega, South Coast (only one entry), 1.

Class 1247.—Pop corn, ten ears—Kable and Son, Orton Park, Bathurst, 1; W. D. Parton, Wyong, Central Coast, 2.

Class 1248.—Championship, ten ears, any variety. Special prize £25, divided amongst five best exhibits according to points scored.

Judged on following scale of points :—

1. Size and weight of ears	20
2. Trueness to type and uniformity of ears (size, shape, and general appearance)	20
3. Character of ears (shape, butt and tip covering, space between rows, evenness of rows) ...	10
4. Uniformity of grain (size, shape, colour, and dent)	20
5. Character of grain (plumpness, shape, depth, colour, and consistency)	10
6. Dryness of grain	10
7. Soundness of grain (freedom from disease and insect injury)	10
	100

J. T. Callaway, Gilmore, Tumut district (Funk's Yellow Dent), 93 points, 1; S. Flett, Taree, Manning River (Golden Beauty), and J. G. Stitt, Taree, Manning River (Funk's Yellow Dent), 92½ points, *aeq.* 2.

AGRICULTURE IN RELATION TO NATIONAL ECONOMIC LIFE.

AGRICULTURAL production is so closely interwoven with the general business structure of the nation, and plays so large a part in America's national economic life, that there is no individual, no matter what his occupation and place, who would not ultimately be affected by continued agricultural depression. Agriculture, by reason of its fundamental place in America's national economy, in the view of the Board, is the mainstay of her general business prosperity.—The *New York Chronicle* discussing a report of the National Industrial Conference Board, New York.

Trials with Kulthi Bean.

IMPORTATION of seed of the Kulthi bean (*Dolichos biflorus*) for trial under New South Wales conditions was arranged in 1924 by courtesy of the Government of Bengal, and trials were conducted at several of the Department's experiment farms. Extracts from the reports on those trials follow :—

"The plants grew quickly and produced a fair amount of bulk. Flowering did not commence until 130 days after sowing owing to the very dry weather in February. The seed was harvested sixty-one days later. . . The plants are semi-procumbent in type, about 12 to 15 inches high, with profuse slender runners. The leaves are numerous, small and light green in colour. The seed is in three colours—black, dun and mottled. They are constricted in the pods and are very small and flattened. Although a fair amount of green bulk was produced, this plant does not compare favourably with other summer legumes such as cowpeas, velvet beans, and Dolichos lablab beans and is not likely to prove of value."—W. H. DARRAGH, Plant Breeder, Grafton Experiment Farm.

"The plot of Kulthi bean was planted as are the varieties in the summer legume trial and compared favourably with the check (Black cowpea) for yield of green fodder or manure, but has the disadvantage of being a later maturer, being at least two months later than the Black cowpea. Frequent irrigations and cultivations were given after germination, at intervals of from 10 to 14 days, but the plants received a check owing to failure of the main water supply during the second week in February. The plants are soft and bulky as well as being fine in texture, and cover the ground by means of runners well furnished with foliage. One row 5 chains long was cut and weighed when the seed was just forming and from this 140 lb. was obtained, which would be equal to 2 tons 15 cwt. per acre. Check rows of Black cowpeas on either side gave 120 lb. and 205 lb. respectively. This bean does not appear to be very palatable, the mature stalks being a little wiry, and stock do not seem to relish the soft hairy leaves. The economic use of this plant appears to be solely for green manure."—F. G. CHOMLEY, Manager, Yanco Experiment Farm.

"Sowing took place on 30th November, 1925, in an excellent clean moist seed-bed, seed being dropped thickly in a shallow furrow. Germination was poor, and the subsequent growth was weak and slow. Flowering commenced on 9th March, 1926, and continued for some time. One row was harvested for green weight on 24th May; only 7 lb., equal to 3 cwt. per acre, was obtained. From the other row a picking of seed was made, the quantity obtained being only ½ lb. Cowpeas in this same trial yielded up to 7 tons of greenstuff per acre, the plots on either side of the Kulthi yielding 2¾ tons and 4¾ tons of greenstuff per acre. The result of this season's trial is about on a par with that obtained last season."—L. J. GREEN, Experimentalist, Hawkesbury Agricultural College.

Bunchy Top in Bananas.

The Nature of the Disease and the Measures Recommended for its Control.

The final report of the Investigation Committee appointed by the Commonwealth, New South Wales, and Queensland Governments to inquire into the cause and nature of bunchy top disease in bananas, and the possible methods of control, has now been made available, and the opportunity is taken to present to *Agricultural Gazette* readers some general indication of the Committee's findings. Attention had already been given to the problem by the Governments of New South Wales and Queensland, and very special attention by Dr. G. P. Darnell-Smith, Biologist, of the first-mentioned Department, the results of whose work proved of considerable value to those responsible for the investigation now discussed. Co-operation by the Governments mentioned was decided upon in 1923, a committee consisting of the Director of the Commonwealth Institute of Science and Industry, the Under Secretary and Director of the New South Wales Department of Agriculture, and the Under Secretary of the Queensland Department of Agriculture, subsequently making certain recommendations as to the conduct of the inquiry, in pursuance of which an Advisory Committee of three scientists—Professor T. G. B. Osborn, D.Sc. (representing the Commonwealth Institute of Science and Industry), Professor R. D. Watt, M.A., B.Sc. (New South Wales), and Professor E. J. Goddard, B.A., D.Sc. (Queensland)—was appointed to review the position and outline a programme of research. The Bunchy Top Investigation, consisting of Professor Goddard (Supervisor), Mr. C. J. Magee, B.Sc. Agr. (Assistant Plant Pathologist), and Mr. H. Collard (Horticulturist), undertook the responsibilities of the inquiry in May, 1924, under the management of the Bunchy Top Control Board.

There still remain certain aspects of the problem requiring further investigation, states the report, and these will receive attention by the continuation of researches at the University of Queensland. Meanwhile, the substance of the results obtained is published in order that they may be applied to the problem of controlling the disease, and, it is hoped, eventually resuscitating the industry in highly affected areas.

The portions of the report presented hereunder touch a few of the aspects of the problem faced by the investigators, and summarise the conclusions arrived at as a result of their research.

Preliminary Investigations.

A considerable amount of work had previously been devoted to the problem by scientific workers in Australia as well as in Fiji (where the disease has been present for at least forty years), Ceylon, Egypt, and the Philippines, but no

definite cause could be proved. It had been suggested by some that the disease was caused by nematodes (in Fiji, Egypt, and the Philippines), while various others had suggested that the causal agent was a fungus, chemical deficiency of the soil, deterioration of the banana stock, climatic factors, aphides, &c. There was no substantive evidence to strengthen the claims of these opinions, and as the ravages of the disease along the Northern Rivers of New South Wales and in south-eastern Queensland were so intense, it

A Bunchy Top Stool.

Note that the leaves are bunched together, narrow, and more erect than is normal.

became clear that any attempt to solve the problem would have to be made by scientific investigators working on the spot. Only in this way would it be possible to determine the actual cause. The Investigation determined to keep the question quite open and to refuse to eliminate any suggested probability or to neglect to consider any probable cause which might arise, unless conclusive evidence compelled.

A laboratory was founded at Tweed Heads, and experimental plots were leased at Cobaki from Messrs. T. Pilgrim and McAlister. The investigation

work at the laboratory was attended to by Mr. C. J. Magee, and the horticultural work at the plots was under the care of Mr. H. Collard. In the interval, awaiting the planting season, Mr. Collard was sent to Fiji to gather first-hand information as to the history of the disease in those islands, its present status, and the possibility of securing resistant or immune stock.

Attempts to isolate any constant fungal or bacterial agent from the various parts of affected plants were unsuccessful, and after a period of six months, during which visits were constantly made to various parts of the affected area, to note the behaviour of plants in deserted plantations as well as the initial and early stages of infection in other plantations, it seemed highly probable that the trouble would not be attributed to any such agent.

Meanwhile the Investigation was also devoting attention to the matter of nematodes or eelworms, since these were found to be abundant in all plantations, their presence being readily indicated by the almost constant presence of galls on the roots of affected and apparently non-affected plants. Plants from Northern Queensland were planted in tanks filled with steam-sterilised soil, and others in tanks of soil from an infected plantation, with a view to settling the possible effect of soil factors, *e.g.*. nematodes, parasitic fungi, and bacteria. in a purely preliminary manner. It soon became apparent that such experiments, if they were to be of any scientific value, would have to be carried out under such conditions of control as obtained in a properly equipped glasshouse.

Keeping in view the possibility that the disease might be of the mosaic type of virus disease, attempts were made to produce the disease in healthy plants from Northern Queensland grown in sterilised soil, and inoculated with the sap of affected plants. There was no evidence manifested for the transmission of the disease in the material used in these preliminary experiments, but it was recognised that further work along these lines should be carried out when the glasshouse was available. Similarly, no results were obtained by inoculating sterilised soil with three species of fungi which were isolated from the roots of some specimens of plants affected with bunchy top. Further, the association over a long period of diseased and healthy plants in sterilised soil and in the same pot, out-of-doors, so that the roots were in intimate association, failed to produce the disease in the healthy plant (an experiment which was later repeated with several plants under glasshouse conditions with the same results). Meanwhile, considerable work was accomplished on the experimental plots.

One of these with excellent soil had previously been affected with bunchy top, and after being leased had been thoroughly ploughed (part of it had rested for a period of several months) prior to the planting of the same by the Investigation in October, 1924. The plants were selected from various areas—some were plants which appeared to have stood out against the disease in affected plantations, some which appeared to have shown some signs of healthy constitution taken from a deserted plantation, healthy plants from

Bribie Island and Bracalba (Queensland), and three species of wild bananas from the neighbourhood of Cairns. The objects in this experiment were to determine the possibilities of resistance in local stocks, the possibilities of recovery from the disease, to make an intensive study of the incidence of the disease in originally undoubtedly healthy plants, and to determine the possible effects of cultural treatment in upholding resistance in healthy plants, and the possible resistance of wild stock to the disease.

Another plot of virgin land which had grown lantana for eight years was cleared and planted with healthy stock from Bracalba. It was considered that, if soil factors such as physical and chemical constitution, bacteria,

A Bunchy Top Stool, Eighteen Months Old.

This stool was derived from the planting of an infected butt, and shows all sections of the plant in an advanced stage of the disease. Note the stunting of the plant, rosetting of the leaves, and the narrow upward-rolling leaf blades.

fungi, or nematodes played the major role in the direct production of the disease, it was possible that the plants on the plot of virgin land would stand out in contrast to those on the other plot which had carried bunchy top plants.

The early outbreak of disease in the plot of virgin land in January, 1925, and its rapid development throughout that plot within a few weeks, contrasted with the very slight development of the disease on the other plot, and led to an intensive study of the conditions prevailing in this plot. It was noticed that aphides were particularly abundant in this plot, an abundance possibly to be attributed to the topography of this lower plot being responsible for the bringing about of conditions more favourable for the aphides.

At once aphides were transferred from affected plants to healthy plants in sterilised soil under insect cages in the grounds of the laboratory, and the disease made its appearance in these experimental plants in about three weeks. The experiments were repeated by transferring aphides from affected to healthy Bracalba plants grown under insect cages in the University grounds

Banana Aphides (wingless stage) on the Unfurling Leaf of a Young Plant (natural size).

at Brisbane, where the disease appeared in several plants within a fortnight. Thus a definite lead was established to the Investigation, and at once preparations were made for following up these results in the glasshouse, arrangements for the construction of which had then been completed.

Cause and Means of Transmission.

It has been definitely proved by this Investigation that bunchy top is a disease transmitted from diseased to healthy plants by the banana aphis (*Pentalonia nigronervosa*). The preliminary evidence of experimental transmission of the disease by means of aphides was obtained in January and

February of last year at the Laboratory at Tweed Heads, and at the Queensland University, but it was necessary that these experiments be confirmed under glasshouse conditions which were available only in April, 1925. The slow growth of plants under winter conditions delayed the suitable time for experiments, but during September, 1925, final proof was obtained of the ability of the banana aphis to act as a vector of the disease.

Further, it has been proved that individuals of the same species of banana aphis, which had not fed on bunchy top plants, are incapable of inducing the disease in healthy plants.

Microscopic examinations and isolation tests have failed to indicate a bacterial, protozoan or fungal organism as the causal agent of the disease. As *Pentalonia nigronervosa* is widespread in banana plantations in North Queensland, where as yet there has been no report of bunchy top, there is reason to believe that in north-eastern New South Wales and south-eastern Queensland this insect is carrying some factor which induces the disease. By analogy with other aphis-transmitted diseases, such as potato and tobacco mosaic, sugar cane mosaic, &c., it would seem that bunchy top comes in the category of the virus diseases. This class is constituted by those transmissible or infectious diseases, caused by an ultra-microscopic agent, which are perpetuated indefinitely by vegetable growth and propagation. Such diseases are in general characterised by chlorosis and may manifest other symptoms such as foliage distortion, excessive chlorophyll production, blight, stunting, proliferation and internal lesions. Diseases caused by infected viruses fall into two divisions—one capable of being produced in healthy plants by artificial juice-transfer inoculation, as in the typical mosaic diseases, and the other a group with more restricted transmission, in which artificial inoculation is ineffective in inducing the disease, as in the case of leaf roll of the potato. It is in this latter group of virus diseases that bunchy top should find a place. Experiments conducted thus far have failed to demonstrate that bunchy top can be transmitted by direct inoculation of sap from diseased to healthy individuals.

The Investigation has therefore arrived at the conclusion that bunchy top is a transmissible disease caused by an ultra-microscopic agent. We are of the opinion that its chief vector or carrier is the banana aphis (*Pentalonia nigronervosa*), and that the spread of the disease in north-eastern New South Wales and south-eastern Queensland has been due primarily to the propagation of infected suckers over wide areas, and then to natural transmission by aphides. There is evidence available that the soil, apart from its harbouring of infective aphides for a limited period does not become infected. As attempts to transmit the disease by direct sap-inoculation have so far met with failure, it would appear that the disease cannot be spread by infected implements during cultural and harvesting operations, such as the pruning of suckers and the cutting of bunches.

Host Plants.

Investigations thus far have not shown any plant other than a member of the genus *Musa* as a positive host of bunchy top. Attempts to transmit the disease to the closely related genera *Strelitzia* and *Ravenala,* and to *Canna* sp., including the arrowroot (*Canna edulis*), the potato (*Solanum tuberosum*), and maize (*Zea mays*) have been unsuccessful. All commercial varieties of the banana grown in Australia are susceptible. The disease has also been transmitted to Manilla hemp (*Musa textilis*) and to a seed-bearing species (*Musa Banksii*) indigenous to the scrubs of North Queensland.

Measures Recommended for Control.

The problem of controlling bunchy top has exercised the minds of the growers very much for the greater part of the period since the disease first made its appearance. Most of the methods suggested to them were of an empirical order, as was bound to be the case in the absence of a knowledge of the nature of the disease itself. Many of the growers have devoted a very considerable amount of time in their endeavours to discover some effective means of dealing with the malady, and they manifested very considerable enthusiasm, especially in efforts to substantiate certain ideas which appeared to them to open up good prospects of success. Numerous types of substances have been utilised in their experiments, and it may be mentioned that in many of the so-called remedies or preventives sold by certain individuals who claim success in the treatment of affected stools, the only ingredients which could be considered as being of any prospective value have been utilised in one form or another by growers.

It may not be out of place to state here preliminarily, that we have every reason for disregarding any one of the so-called specifics advertised, and would, for various reasons, condemn the sale of these substances.

The Investigators, in considering the matter of control, have kept in view two distinct aspects of the bunchy top problem, namely :—

(1) that concerned with the conservation, as far as practicable, of the industry in the affected area, and the problem of bringing the industry in the same area back to its original status, as well as the resuscitation of the industry in those portions of the area where it has become moribund;

(2) the protection of the large area in Queensland which is in no way affected with the disease.

In considering the methods of control, the Committee discuss them under the headings of—(1) Exclusion, (2) Protection, (3) Eradication, (4) Immunisation, (5) Remedial Measures.

Exclusion.—Under the heading of exclusion, the Committee makes a number of recommendations in relation to the inspection of plantations, control of the transportation of suckers, and similar points. No reliance it is

stated can, in practice, be placed on any apparently healthy plants taken from plantations in which bunchy top has ever appeared, since it so often happens that the disease may possibly be latent or may not have developed to the symptomatic stage at the time when such plants are under observation.

Protection.—Protection against the disease, would be efficient, it is stated, if there were available some means of keeping the plants free from aphides. Under such conditions it would be possible to preserve intact a plantation containing healthy plants, despite the proximity of plants affected with the disease. It would be comparatively easy to control the disease if it made its appearance in one or two individual plants which were removed as soon as detected.

The Investigation has given special attention to the possibilities of protection offered by the use of sprays, dusts, and various specifics. On the experimental plots the Investigation has employed nicotine sulphate, pyrethrum powder, calcium cyanide, and chlorocide. This work has been conducted in a very methodical fashion by the Horticulturist, and it may be said that the work has been done more efficiently than would be the case in any commercial undertaking, yet the results do not indicate that spraying is an effective method of control of the aphides. Further, the labour cost has proved prohibitive.

In view of the nature of the disease and the manner in which it is conveyed by aphides, we do not regard with any confidence the value of any substance in repelling aphides and thereby preventing the transmission of the disease.

The difficulty lies largely in the fact that the aphides are to be found in abundance in the soil in the neighbourhood of the corms, and no means of spraying is effective so far as these subterranean individuals are concerned; further, the aphides occur within the old leaf sheaths at the base of the pseudostem and are largely protected consequently, against the action of the spray. Again, spraying fluids available have no lasting effect, as has been demonstrated conclusively in the experimental plots.

Eradication.—Eradication of all stools affected with bunchy top, on a most thorough basis, appears to us to be the real solution of the problem, keeping in view the exclusion of the disease from unaffected areas, the control of the disease in lightly affected areas, and rehabilitation of the heavily affected areas where banana growing has become perilous or moribund.

It is patent, when the mode of transmission of the disease is considered, that eradication of all stools showing any symptoms of the malady and of all stools which may serve for the persistence of the disease and eventual contamination of other stools, should be an ideal towards the attainment of which every possible effort should be made if the affected areas are to again offer facilities for banana growing, and if the northern areas now free from bunchy top are to be conserved. All other methods of control have no value for restoring to health an affected plantation, and have little value in the light of our experiments so far as economic control is concerned, unless eradication is made the basis. The source of the inoculum within a plantation or area,

and the insect vector of the inoculum call for consideration from the standpoint of eradication. From what has been said in connection with the protectionary measures, it is clear that the only chance of success lies in the attempt to deal efficiently with the source of the inoculum, *i.e.*, with affected stools.

The disease is distinctly systemic, and we cannot over-emphasise this fact when recommending that eradication should be interpreted as meaning the removal and destruction of all parts of any stool which has ever developed symptoms of bunchy top in any of its parts. We mention this fact, since attempts are made by some growers to conserve apparently healthy plants in an affected stool by removing the affected parts.

It appears to us, when facing the responsibilities in respect of the control of bunchy top, and in view of the most intimate experience in the field, not only in the old affected areas, but more particularly in the recently discovered affected area in the neighbourhood of the Caboolture River, that the effective control of bunchy top demands very thorough administration and special machinery. In making this statement we have no desire other than to candidly express our opinion that a most serious effort must be made if bunchy top is to be successfully controlled, and that any hope of success is dependent on a very thorough and serious endeavour on the part of growers and Governments.

Immunisation.—There would appear to be little hope of obtaining any variety or species satisfactorily resistant to or immune to bunchy top. Experiments have demonstrated that all species of the genus *Musa*, grown in Australia, including cultivated and wild species of banana and manilla hemp, contract the disease. Although the species may differ slightly in respect of their susceptibility, yet this difference does not by any means open up any preferential possibilities for any particular species. From every point of view it would appear that the Cavendish variety is that most suited for cultivation in Australia, and this species is very prone to develop bunchy top.

Bunchy top devastated the plantations in Fiji and ruined the industry. The disease still occurs there, but is by no means the serious menace it was. At times it does happen that complete replanting is necessary in a few plantations owing to all the plants developing bunchy top. It would appear from the observations made by Mr. H. Collard, Horticulturist to the Bunchy Top Investigation, on his visit to Fiji, that while the disease is prevalent it affects on the average, only a comparatively small percentage of plants in most plantations, although it is rampant in native plantations. It is hard to discover the cause of this, and it would be unscientific to attribute the same to actual immunity or resistance on the part of the plants. Unfortunately, the carefully selected plants which were sent from Fiji for experimental purposes,. were so badly affected with beetle borer, that very little use could be made of them. The result is that immune or resistant stock cannot be definitely reported on.

The Investigation has paid considerable attention to deserted and old plantations with a view to obtaining for observational and experimental purposes suckers from stools which might offer material of a resistant nature. In some cases, suckers having a suggestive history were offered by growers. The suckers used for the experiments were obtained from four different plantations and planted in one of the experimental plots at Cobaki. Despite the limited extent of these experiments, it appears justifiable to regard the chances of finding local resistant stock as meagre.

Remedial Measures.—At times reports are made by growers and enterprising sellers of specifics—fortunately not so frequently now as in past years—that they have knowledge of remedies. It may be definitely stated, in the case of bunchy top as in the case of all other plant virus diseases, that all reputed remedies are valueless. Once the disease has made its appearance in plants, nothing will restore that plant to health, and immediate destruction is the only means of effecting any good.

Conclusions.

The Investigation Committee summarised its conclusions as follows:—

(*a*) No protectionary measures are available.

(*b*) No resistant or immune banana stock is yet available.

(*c*) No remedial measures are available.

(*d*) Measures serving for the *exclusion* of the disease in unaffected areas or from plantations in lightly affected areas, and measures for the *eradication* of the disease from heavily and lightly affected areas, represent the only means available for controlling bunchy top.

(*To be continued.*)

Farmers' Co-operation Invited.

The Department is endeavouring to collect reliable information as to the most suitable species of trees for shade, shelter, fuel, and windbreaks for various districts. A questionnaire is being sent out to societies and individuals from whom information may be expected, but a number of persons will inevitably be omitted whose knowledge on this subject would be of great value to the Department. A copy of the questionnaire is obtainable by any person interested. Briefly, it asks for a short list of the species considered most suitable for—

(*a*) Windbreaks (both for orchards and paddocks);
(*b*) Shade and shelter;
(*c*) Fuel purposes;
(*d*) General timber purposes.

Where the name of a tree is uncertain, specimens should be forwarded for identification to the Director, Botanic Gardens, Sydney.

Correspondence on this subject from farmers and pastoralists will be welcomed. Communications should be addressed to the Under Secretary, Department of Agriculture, Sydney.

The Peanut.

[Continued from page 516.]

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor,
and G. NICHOLSON, H.D.A., Experimentalist, Grafton Experiment Farm.

Time to Harvest.

It is not possible to lay down any hard-and-fast rule as to when peanuts are fit to harvest, the question being governed principally by seasonal conditions. Unlike most crops in general cultivation, the peanut has a protracted flowering period, which results in an uneven ripening of the pods, some being only in process of formation when others are practically fit to harvest. This difference is most marked during wet seasons, as the plants will continue to flower and form pods until the growth is checked by cold weather or frosts. The grower must determine for himself the best time to harvest, and it is only by careful judgment and experience that the knowledge can be obtained. His principal aim should be to harvest when the plants are carrying the maximum number of well-developed mature and undamaged nuts. Peanuts are very susceptible to frosts, and every endeavour should be made to lift the plants before the first frosts appear. No good will be done by allowing the plants to remain in the ground once the tops have been frosted, since this causes many of the nuts to become separated from the plant, resulting in a loss and increased harvesting costs. If properly cured, the tops have considerable feeding value, but if frosted the leaves become brittle, drop off, and what remains is coarse and of low feeding value.

In districts such as the North Coast, where only light frosts are registered late in the season, one of the surest indications that the crop is reaching maturity is a changing of the colour of the foliage to a yellowish brown, and the dropping of the lower leaves. Another reliable means of ascertaining the maturity of the crop, which should be used in conjunction with the former, is to pull up a few plants, allow them to wilt in the sun for a few hours, and then examine the pods. If the pods are full-grown, and the majority of kernels unshrivelled by the effects of the sun, and the insides of the shells show darkened veins, it may be taken as a good indication that the nuts are fit to harvest.

There may be a tendency on the part of inexperienced growers to harvest too early, with the result that the nuts shrivel, weigh light, and are of inferior quality. Manufacturers require a plump kernel which will blanch (permit of removal of the thin skin or testa) easily, and for this reason immature nuts are disliked, since, owing to the toughness of the skin, blanching of these is difficult. Although it is inadvisable to harvest too early, the operation must not be too long delayed, or there is danger of the first-formed nuts commencing to sprout. Sprouted nuts are of very little

commercial value, and their inclusion will lower the value of an otherwise good sample. Sprouting will often occur if rainy weather prevails late in the season, when the crop is nearing maturity. Early varieties like White Spanish sprout rapidly on reaching maturity, and harvesting should therefore not be unduly delayed.

Harvesting is best carried out on bright, warm, sunshiny days, after the dew has dried from the plants. It is necessary that the ground be moderately dry, so that the adhering soil can easily be shaken off the roots without detaching the nuts. On no account must harvesting be carried out when the soil is wet or sticky, or the greatest difficulty will be experienced in obtaining a bright, clean sample. It is important that every effort be made to select a dry period, so that the crop may be harvested and cured with the least amount of injury.

Methods of Harvesting.

The main object to be aimed at in harvesting is to loosen the soil around the plant and cut the tap root immediately below the nuts. The mouldboard plough is the implement most commonly favoured for harvesting peanuts, its use necessitating no extra outlay of capital. The mouldboard may be removed to prevent the throwing of dirt over the plants, and the depth of the plough regulated so that the share cuts the roots immediately below the nuts. On loose, sandy soils ploughing is unnecessary, as the plants can be readily lifted by hand with all the peanuts attached. A boy following the plough has lifted and set in heaps as much as three-quarters of an acre per day.

On loose soils the potato digger has been found to give very satisfactory results, and, where available, should be used in preference to the plough. It is superior to the plough, inasmuch that it can be set to cut off the roots at the desired depth, removes the plants from the soil, shakes the dirt off the nuts, and leaves them lying on the surface of the ground. Owing to the initial cost of the potato digger, however, the outlay is not warranted unless a large area is to be harvested. Any machine that will cut the roots and loosen the ground around the nuts may be used. but for all practical purposes the plough is the most economical and effective implement for small areas where the plants will not pull up so easily by hand.

As previously stated, favourable weather conditions should be selected for harvesting. Should rain fall before the plants are stacked, discolouration of the nuts and consequent reduction in value is likely to result.

Curing and Stacking.

This is one of the most important operations in peanut culture, and every care should be taken if a first-class product is to be procured. Careless methods of curing may result in the destruction of an otherwise high yielding crop. After the plants have been loosened by the plough and the soil shaken from the nuts, they should be allowed to lie on the ground to wilt. Two or three rows may be thrown together to form windrows, but

care must be taken not to place the vines too close together, or drying will be slow and uneven.

There are four methods of drying peanuts:—

(1) Stacking around poles.
(2) Raking into windrows and cocking.
(3) Stooking.
(4) Barn-drying.

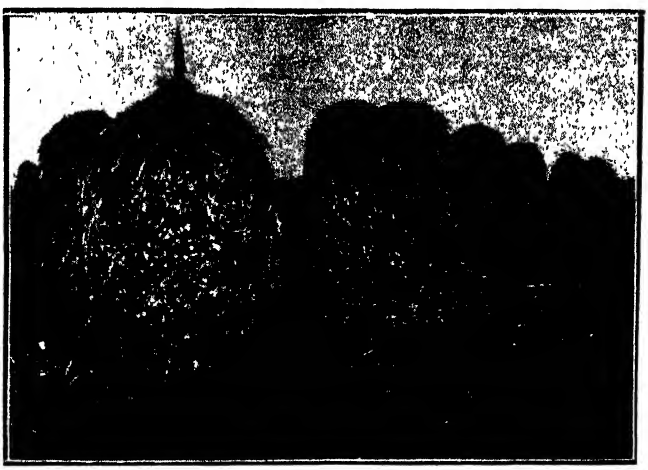
(1) *Stacking around Poles.*—This is the most laborious method, but for the following reasons is the best to adopt:—

(*a*) A good sample of hay can be obtained.
(*b*) The nuts cure slowly and evenly and do not shrivel.
(*c*) If stacked correctly there is little danger of the kernels moulding or the shells discolouring.
(*d*) The nuts are protected from the ravages of birds, and to a lesser degree from mice and other rodents.
(*e*) If wet weather prevails there is less danger of deterioration.

In districts where there is a likelihood of heavy rain falling during the curing period stacking is advisable. The plants are ready to stack when all surface moisture has dried off and the foliage has wilted. The time taken will depend on weather conditions, but if these are favourable stacking may commence within four hours. If allowed to become dry and brittle many of the leaves will drop off and the nuts will become discoloured, shrivel, and lose in weight. The plants lifted in the morning will generally be fit for stacking during the afternoon, while those dug in the afternoon may be stacked the following morning when the dew has dried. From fifteen to twenty poles, 7 feet long and 2 to 3 inches in diameter, sharpened at one end, are required for stacking one acre of peanuts. Saplings cut from the bush will answer admirably for this purpose. After all the rows of peanuts that can be dealt with in the day have been dug, the poles are distributed at suitable intervals throughout the field. Generally there will be one row of stacks to every twelve to fourteen rows of peanuts. If the paddock is required immediately for another crop, or if it is desired to allow pigs to clean up the nuts that have been left behind in harvesting, the plants may be carted to a central point, and the poles erected in one group. On this point the grower can determine for himself the method best suited to his requirements. The poles are erected by placing them firmly in the ground to a depth of about 12 inches, so that there will be little possibility of being blown over during windy weather. Two pieces of scrap timber 18 to 20 inches long are then nailed on, at right angles to the pole and to one another, about 8 inches from the ground. These cross pieces form the base of the stack and are used to prevent the plants coming into direct contact with the ground. To facilitate stacking, the plants are forked into a circle of convenient diameter around the pole, with the roots facing inwards.

Everything is now in readiness for building. A number of plants are laid across the cross pieces to form the foundation of the stack, in the building

of which the vines are placed evenly around the pole and pressed down, always keeping the nuts nearest the pole. As the stacking proceeds a bunch or two may be hung around the pole to help bind it. Building should be continued in this manner until nearing the top of the pole, when the stack should be gradually drawn to a point. To prevent moisture entering the stacks they may be capped with a small quantity of dry grass, but care must be taken not to make the covering too thick, otherwise the free circulation of air is retarded, and there is a likelihood of the nuts sweating and moulding. One of the principal points to bear in mind when stacking is to keep the centre of the stack always higher than the outside, so that any rain that falls will be easily shed. The diameter of the stack will be governed principally by climatic conditions—the dryer the climate the larger the stack. In moist, humid districts stacks should not exceed 36 to 42 inches



Method of Curing Peanuts in the Field on Stakes.

in diameter, otherwise the drying period is protracted, and a free circulation of air is prevented. The time taken to cure will depend mainly on weather conditions and the size of the stack, but generally the period is from three to six weeks. Too early picking will result in a shrivelling of the pods and danger of heating and fermentation. Fitness for picking is indicated when the shells are dry and the pods firm. Immature nuts require a longer drying period, and it is necessary that these be thoroughly dry before threshing, as they are frequently the cause of heating when stored in bulk. If, after drying, the peanuts cannot be picked immediately, they should be carted and stacked in a dry, airy barn.

(2) *Raking into Windrows and Cocking.*—The principal advantages of this method of drying are:—

(*a*) The expense of obtaining and erecting poles is dispensed with.
(*b*) Less labour required, hence the cost is lower.
(*c*) The drying period is considerably reduced.

The disadvantages are:—

(*a*) If wet weather prevails after harvesting there is a danger of spoiling the whole crop, or at least obtaining a sample of mouldy and discoloured nuts.

(*b*) As drying takes place much more quickly, the number of shrivelled kernels will be increased.

(*c*) Loss of nuts due to birds.

(*d*) Inferior quality hay.

This system may be used to advantage in those districts where a reasonably dry harvesting period is assured and when labour is scarce and poles are difficult to procure. The principles of curing are similar to those adopted for lucerne hay. When the plants have cured or wilted, they are raked or forked into windrows, and later cocked. Sometimes cocking without previously placing into windrows is practised, if the plants have lost their foliage and the stems are fairly dry.

Stooking.—Another method of drying peanuts is to stook them in long, narrow rows with the roots uppermost. To facilitate stooking, two short sticks are placed in the ground about 12 inches apart, these acting as a support from which the stook (about 18 inches wide) can be built up. Although the danger of the nuts moulding, due to wet weather, is minimised, birds will account for a fair number of nuts. If wet weather prevails the hay is practically valueless.

Barn-drying.—Where shed room is available, the plants can be carted in after wilting for a few days in windrows or small heaps with the nuts exposed to the sun, and the final curing done in the shed. Care must be taken to have the nuts all fully exposed to the air. Several circular hollow stacks built up of plants with all the nuts opening on to the hollow centre of the stack, which is supported on an open frame a few inches off the ground, will give the required ventilation to the nuts and make a good sample of hay from the tops When the tops have wilted or dried sufficiently to stack safely for hay is the stage at which the plants should be taken into the shed for this final curing.

Sometimes peanuts are dried in airy sheds or barns by placing the plants in thin layers upon moveable platforms constructed of poles. When drying is completed the poles are pulled out and the plants fall to the floor of the barn. In cases where only a small area is devoted to peanuts and the requisite barn space is available, this system is to be recommended, since the danger of the crop being spoilt by rain is eliminated. Care must be exercised to see that the barn is well ventilated, so that no moulding or fermentation is likely to occur.

Picking and Cleaning.

Peanuts must be thoroughly dry before picking, and for satisfactory work the best time to pick is during dry weather. If the atmosphere is moist the plants will be tough and the pods difficult to detach. Hand-picking is dusty,

slow and costly work, and has gone very much out of favour in those peanut-growing countries where cheap black labour is unobtainable. To grow peanuts on a large commercial basis, it is necessary to have machines for picking and cleaning. Unless a farmer has a large area under peanuts, such a machine would be an expensive item, but where a number of growers are situated in close proximity to each other a machine could be purchased and run on community lines. A man will hand-pick in one day from eighty to 100 pounds of White Spanish nuts, whereas some machines are capable of handling the crop at the rate of 3,000 lb. per day.

There are two types of machines in use for picking peanuts. The ordinary grain thresher, run slowly and fitted with a special peanut cylinder, has given satisfactory results for small-podded varieties such as White Spanish. The principal disadvantage of this machine is that it has a tendency to crack the shells, but this fault can be overcome to a large degree if special care is observed in feeding and the machine run at about 400 revolutions per minute. Cracked shells cause deterioration of the kernels, although if the peanuts are to be shelled shortly after threshing this is not a very objectionable feature.

The other machine used for threshing is known as the "peanut-picker." It works on an entirely different principle to the thresher, the plants being drawn over a horizontal wire mesh. The nuts fall through or are detached from the plants by the aid of rubber brushes working on the lower side of the mesh. These machines are also fitted with various appliances for cleaning, stemming and removing the dirt from the nuts.

Where hand-picking is practised considerable time will be saved by the use of a wooden frame about 3 by 6 feet, over which is tightly stretched ordinary rabbit-proof wire-netting. This is set up in a convenient position against a wall or fence at an angle of about sixty degrees. The plants are drawn across the frame by hand, the majority of the nuts catching in the wire meshes are detached, and fall on to the ground or into a suitable receptacle provided for the purpose. This method is much quicker than picking the nuts off one by one, but the sample obtained is not so good, since portion of the stems will adhere to some of the nuts.

Another method is to grasp the haulms of the plant in the hand and beat the roots over a horizontal rail, the jar dislodging the majority of the nuts, though any coming into direct contact with the rail may, of course, be split or damaged. To prevent the nuts scattering over the ground, a trough or container made of hessian or bags may be arranged beneath the rail so as to catch the nuts as they fall. If the work is carried out on bright, sunny days, the nuts will thresh more easily and cleaner. They should be winnowed before bagging to rid them of as much dirt, leaves, or other rubbish as possible. Hand-picking, although slow and expensive, will give the highest grade nuts.

Do not remove the plants from the stack while in the paddock, as there will be a considerable loss of nuts due to shattering. The entire stack, including the pole, is rooted up with the aid of a crowbar and carted to

some central place where the peanuts are to be threshed or the plants stored in bulk. If the stack is turned upside down the majority of the plants will slide off, and the pole can then be easily removed.

After picking, the peanuts should be bagged and stored in a dry, airy barn, out of the reach of mice and rats, which are very destructive to both bags and nuts. To assure a free circulation of air, alleyways should be allowed between every double tier. On no account should the bags be stacked directly on an earth or concrete floor, as the nuts are likely to draw the moisture, which will cause discolouration of the shells, and probably result in damage to the kernels. If there is any likelihood of the nuts sweating, owing to being picked before being thoroughly dry, they should be spread in thin layers on a dry surface. Provided peanuts have been properly dried and stored and the shells are undamaged, they will keep for a considerable period without deteriorating.

(*To be concluded.*)

White Ants in Fruit Trees.

In parts of the central west, where the rainfall may be deficient for a season or two, one of the handicaps to orcharding is the liability of the trees to infestation by white ants. A method reputed to keep the pests in check is to split up softwood boards (such as those used in packing-cases), bore a small hole 5 or 6 inches up the centre of each strip, fill with arsenic, and plug up. Three or four of the strips of wood thus treated are placed around each tree. The ants attack the softwood in preference to the tree, eat through the plug, and are so poisoned.—W. le Gay Brereton, Assistant Fruit Expert.

"Farm Calculations and Accounts."

While not exhaustive, this book of 220 pages provides agricultural students and farmers with a course of applied calculations that will at least form a basis for further advance toward scientific farming. Following a statement of arithmetical method, including commercial accounts and such matter as the weight and composition of soils and their ingredients and the mixing of manures, the book proceeds with the calculation of costs in relation to farm operations, the balancing of rations for live-stock, with a great deal of detail relative to commercial livestock keeping, and closes with a section on accounts and calculations affecting dairying.

The book adopts somewhat the class-room method, and though its usefulness to farmers in this country is rather limited by its English outlook, the principles are well stated. The joint authors are lecturers in agricultural economics at Leeds University.

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The Woolly Aphis Parasite.

(*Aphelinus mali* HALD.)

W. B. GURNEY, B.Sc., F.E.S., Entomologist.

THIS minute Chalcid parasite (*Aphelinus mali*, Hald.) was first mentioned by Haldeman in the American *Quarterly Journal of Agriculture and Science* in 1847. In 1859 it was described by him under the generic name of *Eriophilus* in *Proc. of the Boston Nat. Hist. Soc.* Later, in 1881, Dr. L. O. Howard in his annual report for 1880, placed this species in its present genus *Aphelinus*.

According to Arnold E. Lundie, to whom we are indebted for a comprehensive memoir on the development and distribution of this parasite and from whom we have quoted in this article, there is considerable evidence that the woolly aphis, *Eriosoma lanigera*, is a North American aphis which has spread from there to other regions of the world where apples are grown. The parasite, however, does not always seem to have followed this host. We recorded the parasite in certain other aphis in the vicinity of Sydney previous to its introduction here from New Zealand. For instance, Mr. E. Zeck, my assistant, developed the parasite from chrysanthemum aphis at Sydney and collected a few adults of the parasite in an apple orchard at Eastwood prior to the liberation of the introduced parasites. These parasites we identified as *Aphelinus mali* and some were forwarded to Mr. A. A. Girault, Assistant Entomologist, Department of Agriculture, Brisbane, who identified them as *Aphelinus niger*, Girault, described from Queensland; but this he later reported he found to be synonomous with *Aphelinus mali*. It would appear therefore that some strain of the parasite was present in Eastern Australia prior to the introduction of fresh stocks from New Zealand.

Woolly aphis has been for many years a persistent pest of apple trees and so resistant to control even by repeated sprayings with tobacco wash, nicotine sulphate and other contact sprays that in 1923 I urged the introduction of the parasite *Aphelinus mali* from the United States. Accordingly the Department of Agriculture wrote to Dr. L. O. Howard, Chief Entomologist, Bureau of Entomology, Washington, D.C., for a batch of living parasites. He reported that he would endeavour to send some, but suggested getting specimens from New Zealand, if obtainable, as, though they had but recently established the parasite in New Zealand, they might be able to spare some and save a long oversea trip from the United States. Meanwhile Dr. R. J. Tillyard, of the Cawthron Institute, offered to send some parasites, and the Department of Agriculture gladly availed itself of this offer, Dr. Tillyard forwarding enough specimens for the supply of other States of the Commonwealth.

In the first instance it was arranged that the parasites should not come from any part of New Zealand known to have fire blight present in the orchards. Further, to preclude any danger of the introduction of fire blight, and acting on the advice of our Biologist, the twigs from New

Fig. 1.—Showing the Special Gauge and Cloth Sleeve in which an Aphis Infested Twig was enclosed in making Initial Liberations of the Parasite.

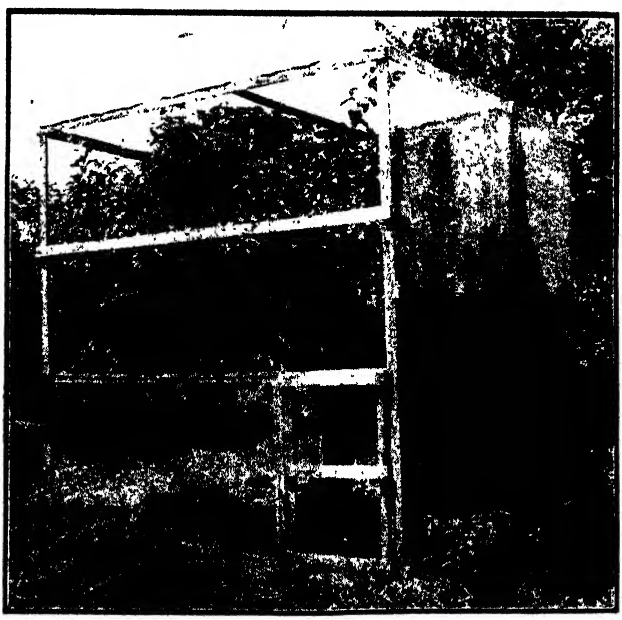


Fig. 2.—Showing the Aphis Infested Tree, enclosed in Wire Netting and Hessian, on which the First Liberation of the Parasite was made.

Zealand bearing the parasitised aphis were held in quarantine for a period of several months, at the Entomological Branch here. A special cloth and gauze insectary was constructed and the parasites were developed on woolly

aphides through several generations. Later, by courtesy of Mr. E. Eager, the owner of the property, they were developed on woolly aphides on an apple tree selected and enclosed at an orchard at Eastwood. Meanwhile the original twigs from New Zealand were destroyed. These precautions were taken to obviate any possibility of introducing fire blight from New Zealand.

The original enclosed apple tree at Eastwood on which the parasite *Aphelinus mali* was first developed in quantity is shown in Figs. 1 and 2. They were established on this tree from parasites removed from the quarantine insectary and liberated on aphis-infested twigs enclosed in special cloth sleeves and also in gauze and cloth sleeves devised for the purpose. This method proved successful, and enough parasites were developed during the summer of 1924-5 for initial distributions to the main apple-growing districts of the State.

Number of Parasites Distributed.

Sixty-four batches of apple twigs bearing parasitised woolly aphis were despatched to the various apple-growing districts during the latter half of the summer of 1924-5. The number of living parasites sent out was estimated at between 2,000 and 3,000. Among the districts which received these specimens were Armidale, Batlow, Bathurst, Bowral, Copeland, Dorrigo, Glen Innes, Kentucky, Kelso, Leeton, Penrose, Uralla, Yanco, Yetholme and the vicinity of Sydney.

A further 133 batches of twigs bearing parasitised aphides were sent out during August and September, 1925, representing a distribution of some 6,000 living parasites. Again, in November and December, 1925, fifty-five batches of parasitised twigs, estimated to produce 2,000 parasites, were sent out. These various batches enabled us not only to send further consignments to the previously mentioned districts, but to supply also a number of other apple-growing districts, such as Albury, Aylmerton, Borenore, Blue Mountains, Gosford, Goulburn, Mirrool, Wallendbeen, Young, Capertee, Exeter, Griffith, Mangrove Mountain, and even despatch some to Port Moresby, Papua.

During 1926, from January to April, sixty-two batches of parasites yielding approximately 2,000 parasites were sent out.

It will be seen that approximately 12,000 parasites have been distributed to the main apple-growing districts of the State during the past eighteen months, and this useful parasite is now firmly established. Reports to hand show that in most of these centres the parasites have become well established, and during the coming season should make a wider and more appreciable spread and prove of value in reducing the woolly aphis pest. In certain instances, owing to unfavourable conditions, such as wet and windy weather at the time of liberation, the parasites may not have taken appreciably; but on the whole the liberation of a few dozen parasites within an orchard usually results in their firm establishment, and during a summer season they increase and spread widely throughout the orchard. Next

season it is hoped that the orchardists within the various districts where the parasites have been established will spread the parasite within their own orchards, and also send twigs with parasitised aphis to adjacent orchardists who have not yet received specimens. In this way an intensive and rapid spread of the parasite can be ensured.

Whether the parasite will control the woolly aphis every season or not remains to be proved, but there are indications that in some seasons at least it will do its work so thoroughly in orchards where it is well established that it may obviate the need for spraying during that season.

Life-history of the Parasite.

Data shows that the life cycle of the parasite from the laying of the egg and through the development of the larva and pupa within the aphis until the adult wasp hatches out occupies three to four weeks, and that it is slower in development in the cooler weather, as might be expected. During the cold months here, from May to August, the parasite is usually hibernating in the bodies of the aphis. Occasionally however, adult wasps hatch out in cold weather.

The Egg.—The parasite inserts her small ovipositor into the body of a well-grown aphis and deposits a minute elongate egg about one-fifth of a millimetre in length. The egg hatches, in summer, within three or four days. As each female is capable of laying from fifty to over one hundred eggs, the eggs first laid will have produced larvæ or even adult wasps before the later laid eggs have hatched.

The Larva.—The minute grub or larva which hatches from the egg is at first extremely small, but possesses a small head with biting jaws. It feeds on the internal juices of the bodies of the aphis, growing broader and thicker as it develops, and is fully grown in about twelve days during warm weather. The aphis, which is eventually killed by the internal parasite, appears at first restless and uncomfortable and tends to crawl away from the others before it dies: many, however, die without moving far from the clusters of other aphis. As it dies the body is noticed to swell and turn black, while the skin hardens. These black rounded parasitised aphis begin to show up distinctly, especially as they no longer cover themselves with the white flocculent secretion natural to healthy unparasitised woolly aphis.

The Pupa.—The full-grown larva next changes to the pupa, which is yellowish in colour, and the legs, wings and eyes of the future adult become visible. During the summer this pupal stage occupies about seven days before the change to the active winged little adult occurs. The pupal period is longer in cold weather.

The Adult.—When the pupa changes to the adult within the body of the dead aphis, it has small jaws and bites a minute circular hole in the skin of its host, crawls out, and, shortly afterwards, flies off These small holes in the dead aphis indicate that the wasps have emerged and

are probably at work laying eggs in other living woolly aphis. The adult wasp is an extremely small black insect with four minute transparent gauzy wings. Its length is only about a twenty-fifth of an inch and it is just visible to the naked eye. The body is black; the antennæ yellow, and there is a touch of yellow at the base of the abdomen. The female is rather larger and stouter than the male and possesses a small ovipositor which the male does not.

Number of Generations.—The length of the life cycle (that is, from the laying of the egg to the time the adult wasp emerges) is found to vary between nineteen and forty-three days according to some American records, and generally occupies about twenty-four days. Naturally the period is longer in cool weather when development is slower. In summer therefore we may expect a new generation every three to four weeks. This data would indicate that six or more generations of parasites may occur each summer, though the generations are found to overlap considerably.

As stated, warm weather hastens the development, while cold weather may retard development considerably. Only one parasite develops in one aphis. The number of eggs laid by a single female in an investigation by Lundie ranged from forty-eight to 140, and the average number laid per day was three or four.

Longevity of the Adult Wasps.

The length of life for the adult winged wasp parasite under eage conditions ranged from a few days up to forty-two days and averaged about twenty days. Some died within a week while others lived as long as five or six weeks as adult wasps. No difference is recorded between the length of life of the males and females. It has been noted that the cool weather favours a longer life for the adult wasp. It seems possible therefore, that some of the adults may survive through the midwinter months.

Establishing the Parasite in an Orchard.

When one or several twigs bearing parasitised woolly aphis are received these twigs are merely tied to an infested branch or twig on an apple tree in the orchard. The parasites on emerging in spring or summer will readily find the woolly aphis and parasitise them so that the parasite may become well established within about six weeks or eight weeks—that is, after one or two generations of the parasite have had time to develop. The winged parasites will of course spread to the immediately adjacent trees and even further in the orchard, and by the end of the summer season may have spread and made a noticeable reduction in the aphis. The spread in the orchard should be assisted by cutting twigs with parasitised aphis from the first infested tree and tying them then on to other trees throughout the orchard. Parasitised woolly aphis may be readily recognised by their black swollen bodies and the absence of the white secretion covering the healthy aphides.

As mentioned, the parasitised aphis tend to crawl to the butt of the tree just before the winter, and it is found that a bandage, such as is used for

codling moth, attracts them. Orchard Inspector Lindsay has also noted this in the Armidale district, and suggests that such bandages might be transferred about August to unparasitised trees, thus aiding the spread of the parasite within the orchard early in spring.

It would perhaps be advisable not to spray the original tree on which the parasite is established, though all the other trees, if infested with woolly aphis, could be sprayed in the spring or early summer. As the parasite spreads, the need for spraying should gradually diminish.

Effect of Spraying on the Parasite.

It is not thought likely that arsenate of lead spray applied for the control of codling moth will affect the woolly aphis parasite, but it was considered that contact sprays might kill or reduce it. In preliminary laboratory

Fig. 8.—Showing Aphis Infested Twigs on which are the Dark Bodied Parasitised Aphis.

tests, however, in which miscible red oil spray, lime-sulphur, and nicotine sulphate were applied to parasitised aphis on twigs, some of the parasites emerged after treatment, as also did some on the untreated twigs. The tests in the laboratory and the field are not completed, but so far they show that these contact sprays do not kill all the parasites, if any. As the parasitised woolly aphis have a tendency before the winter to move towards the butt of the trees and even on to the soil around the butt, it may be well not to drench the trees in winter when spraying with oil or lime-sulphur so that the spray runs down and drenches these hibernating parasitised aphis.

Again, in summer, nicotine sulphate spray for woolly aphis is more likely to destroy a few of the adult winged wasps rather than the larvæ or pupæ of the parasites which are sheltered and protected within the bodies of the aphides.

Hosts of the Parasite *Aphelinus Mali.*

Besides parasitising *Eriosoma lanigera,* the woolly aphis of apple trees, this parasite has been recorded attacking other aphides on other plants, including the following:—*Aphis brassicæ, A. monardæ, A. mali, A. sacchari, A. setariæ,* and the rose aphides *Siphonophora rosæ,* var. *floridæ,* and *Macrosiphum rosæ.* In addition it has been found parasitising *Pemphigus fraxinifolii, Toxoptera graminum, Colopha eragrostidis, Tetraneura colophoidea, Myzus mahaleb* and *Glyphina eragrostidis.*

Distribution of the Parasite.

The natural home of the parasite is thought to be North America, but it has been introduced into France, Italy, South Africa, South America and New Zealand, as well as Australia. As indicated, a strain of this species had already been recorded in New South Wales and Queensland before the introduction of strains from New Zealand in woolly aphis.

Regarding its value, it seems likely that it may prove of utility in control of woolly aphis in Australia, even though occasional spraying may still be necessary. The re-establishment of the parasite in some orchards or districts may also become necessary should the parasite eliminate its host and temporarily die down or pass right out of existence from time to time.

Dr. L. O. Howard, in an American report in April of this year, mentions the value of this parasite, which was supplied directly or indirectly through the Washington Bureau of Entomology to New Zealand, Australia, South America and Europe, and states that "there is reason to hope that *Aphelinus mali* will approximate this record [referring to another useful parasite] in the control of the woolly apple aphis in New Zealand and parts of Australia, although the same insect in France, Italy and South Africa seems to be less efficient."

REFERENCES TO LITERATURE.

HALDEMANN, S. S.—*Eriophilus.* Boston Soc. Nat. Hist. Proc., 1852, p. 6, 402.

HOWARD, L. O.—Report on parasites of the Coccidæ, etc., U.S. Comm. Agric. Ann. Report, 1880, p. 350–73, 1881.

Revision of the Aphelininæ of North America. U.S. Ent. Div. Tech. Ser. Bull. 1, 1895.

Parasite Control of Insect Pests, *Jour. Econ. Ent.* 1926, Vol. 19, p. 272–282.

LUNDIE, ARNOLD E.—A Biological Study of *Aphelinus mali,* Hald. etc. Memoir 79 Agric. Exper. Sta., Cornell University, 1924.

MILK records prove that it pays handsomely to give dairy cows the best care and kind treatment. This includes regularity in milking, protection from rain and cold, and particularly the necessity for good and efficient milking.

Maize and Sorghum for Green Fodder.

TRIALS AT WOLLONGBAR EXPERIMENT FARM, 1921–26.

R. N. MEDLEY, H.D.A., Experimentalist.

Feeding Qualities of Maize and Sorghum.

FROM a purely feeding standpoint maize and sorghum possess many merits in common; both provide a succulent, palatable green fodder of high carbohydrate content, and this factor alone makes them valuable for use in feeding to stock to bring them into good condition, and maintain them in such condition. The feeding of either of these crops alone to working horses or dairy stock does not give permanent satisfactory results, as both are proportionately low in proteins. To obtain satisfactory results it is necessary that some concentrate, or other crop rich in protein, be fed in addition, so forming a balanced ration.

Maize when fed alone to dairy stock will give comparatively better results than sorghum, but the reverse obtains on feeding working horses. Sorghum possesses the advantage that after the leaves die the stalks retain their succulence and palatability much longer than will those of maize under similar conditions. Both crops are very suited for making into silage, but sorghum actually makes a more acid silage than maize, and in many cases stock show a decided preference for it. As with all silage made from one crop only, it is necessary to add some other foodstuff to constitute a balanced ration—in the case of these crops proteins (nitrogenous matter) in some form or other.

The poisonous property of sorghum which is immature, or which has been frosted or affected by droughty conditions, has been the cause of much prejudice on the part of farmers against this crop, but with the exercise of a little care all danger from this source can be eliminated. Maize, of course, can be cut at any stage of growth, and fed immediately without the precautions that have to be observed when feeding sorghum. The poisonous property of sorghum is due to the presence in the plant juices of cyanogenetic glucosides, which, when the plant is eaten by stock, are changed into prussic acid by the action of enzymes in the digestive juices. In the early stages of the plant the poisonous substances are found throughout the plant. As the plant ages they disappear from the stalks, but remain in the leaves until the grain forms, after which stage the plant can be fed with perfect safety.

Sorghum, when immature, or frosted, or stunted by drought, should be cut and allowed to wilt for twenty-four hours before being fed. Mature sorghum can be fed with perfect safety as regards prussic acid poisoning, but there is the danger, as with any other green fodder, of the animals engorging themselves, and hoven resulting.

The Experiment.

With a view to comparing the fodder-yielding capacities of Fitzroy maize, Cocke's Prolific maize and Saccaline sorghum an experiment was commenced at Wollongbar Experiment Farm during the 1921-22 season. This trial has been conducted each season since that time with varying results, but a summary at this stage should give an accurate representation of the yielding abilities of the crops under the climatic and soil conditions of the area, of which this farm is considered typical.

The experiment was sown each season on well-prepared soil of volcanic origin, red in colour, and well known for its high production of green fodder, especially from non-leguminous crops. Each plot received exactly similar treatment as regards sowing, cultivation (before and after sowing), fertilisers, and harvesting. The maize varieties were sown at the rate of 14 lb. per acre and the sorghum at 10 lb., sowing being done by means of a maize dropper. Fertiliser, consisting of bonedust and superphosphate, was applied with the seed at the rate of 2 cwt. per acre. Harvesting was carried out as soon as the plants had reached the "glazing" stage, in the case of the maize, and when the grain had fully formed in the case of the sorghum. All plots were cut on the same day, and to obviate loss by wilting the material was weighed immediately after cutting.

The rainfall registered in the different seasons was as follows:—

	1921-22.	1922-23.	1923-24.	1924-25.	1925-26.
	pts.	pts.	pts.	pts.	pts.
November	......	46	......	......	......
December	1,220	290	433	226	263
January	384	189	444	877	610
February...	1,939	201	275	273	89
March	408	......	409	2,544	650
April	......	......	......	......	581
Total	3,951	726	1,561	3,920	2,193

The Seasons.

1921-22.—Trial planted for the first time on 3rd December, 1921. The Saccaline germinated well, but the maize was very patchy. Growing conditions were favourable, and heavier yields would have been obtained had the germination been better.

1922-23.—All plots sown on 9th November, 1922. Owing to a long spell of dry weather germination was very poor, as also was subsequent growth. When rain did fall the plants were too far gone to recover, and all plots were fed off early in February, no weights being taken.

1923-24.—Sowing took place on 5th December, 1923. Germination was fair; growing conditions were favourable, and heavier yields should have resulted. This is more noticeable when the yields from this experiment are compared with those obtained from other parts of the farm. Saccaline was not sown in this season's trial owing to the dry conditions at sowing time.

1924-25.—Plots sown on 12th December, 1924. Good germination; high but unevenly distributed rainfall, over 25 inches falling during the last month of growth.

1925-26.—Sowing took place on 16th December, 1925. A good germination resulted, and early growth was vigorous, but the plants received a severe check in February through a dry spell. The maize plants suffered badly by wilting, but the Saccaline plants withstood the adverse conditions much better.

The results were as follows:—

	1921-22.	1923-24	1924-25.	1925-26.	Average for 3 years.	Average for 4 years.
	t. c. q. lb.	t. c. q. lb	t. c. q lb	t. c q. lb.	t. c. q. lb.	t. c. q. lb.
Saccaline	9 4 1 0	....	9 0 3 13	9 9 0 25	9 4 3 3	.
Fitzroy	6 19 0 0	6 7 1 0	12 12 1 5	11 0 1 8	10 3 3 14	9 4 2 24
Cocke's Prolific .. .	5 10 0 14	4 3 0 0	7 13 0 16	8 15 0 16	7 6 0 15	6 10 1 11

Conclusions.

Reviewing the results of the trial it can be safely stated that Cocke's Prolific maize does not compare profitably, even favourably, with either Fitzroy maize or Saccaline sorghum as a green fodder crop. Between Fitzroy maize and Saccaline sorghum there is very little to choose. Fitzroy will outyield Saccaline in good seasons, but Saccaline is a more consistent yielder, and will withstand dry conditions much better, recovering and making new growth much sooner than the maize. As there is so little to choose between these two, and as they are very much liked by stock, and equally easy to grow, a farmer cannot go far wrong in choosing either.

Hickory King Maize Contest.

Arrangements have been completed for a competition among farmers during the coming season to determine the best strain of Hickory King maize for the manufacture of cornflour. The conditions will generally be similar to those governing the contests in previous seasons, and Messrs. Clifford Love and Co., Ltd., Sydney, are again donating £10 10s. to be used for prizes. Each competitor should send 10 lb. of his competing seed to the Under-Secretary, Department of Agriculture, Sydney, before 31st August. The parcel should be labelled "For Hickory King Contest," and contain a note of the sender's name and address.

Control of Weeds on Railway Lands.

Among the resolutions passed at the recent conference of Westen District branches of the Agricutural Bureau, was one with reference to the weed growth to be found on railway lands traversing the various shires. Farmers will be interested to know that the Agricultural Department is co-operating with railway officials in this matter, and that in compliance with a request of the latter a supply of descriptive literature is being made available, in order that railway employees may familiarise themselves with the appearance and habit of the worst weeds.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize:—

Fitzroy	L. Waters, Yarramalong.
	F. W. Hill, "Willow Vale," Yarramalong.
	R. W. Hindmarsh, "Wiaraga," Bellingen.
Leaming	Manager, Experiment Farm, Grafton.
Ulmarra Whitecap	R. W. Hindmarsh, "Wiaraga," Bellingen.
Funk's Yellow Dent	N. C. Pyemont, Moondarra, Gundagai.

Potatoes:—

Factor	K. Bowen, "Belleview," Springside.

Broom Millet:—

White Italian	W. Lye, Loomberah.

Sudan Grass:—

	Manager, Experiment Farm, Cowra.

Sweet Sorghums:—

Collier	Manager, Experiment Farm, Grafton.
No. 61	Manager, Experiment Farm, Grafton.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Grass is also a Crop.

Farming is a business, and the justification for any farming practice is in the financial results. The farmer who grows wheat applies superphosphate when putting in his crop, because he realises that, except on particularly good soils, all the previous labour—the clearing, cultivation, &c., of the land —would go for little or nothing without a few pounds of superphosphate per acre. It is necessary for the farmer to realise that grass is also a crop, and a crop even more dependent on the addition of substances which are unavailable or deficient in the soil than are cultivated crops.—A. B. Adams, in the *Journal of the Department of Agriculture,* Western Australia.

Apiary Notes.

W. A. GOODACRE, Senior Apiary Instructor.

THE Department is at all times interested in inquiries received from apiarists, and many of their queries open up matters of general interest. Recently a young man, who had increased his colonies to about fifty in a commercial centre, desired to remove to a new locality about thirty miles distant to allow of greater opportunity for extension of his business. In reply to his inquiry whether the part was favourable, he was advised that the locality was a promising one and well worth testing out, but we could not advocate a young man of his experience staking all he had gained in such pioneering work. It would be best to place a few of his colonies there and to build up to permanency as the locality proved itself.

Too many promising young apiarists have placed too much at stake in such pioneering work, only to find out when it is too late, perhaps, that the new part was unfavourable, probably owing to unsuitable flowering periods of certain flora. Often a few miles make quite a difference in this respect. For the pioneering spirit that animates such young apiarists it is impossible to withhold admiration. They must not risk too much too early in their venture. With more experience and with out-apiaries to test the positions first it is possible to carry out extensions with a minimum of risk.

This question of new locality has other aspects of interest also, and many bee farmers of long standing agree with me that a locality improves for honey and pollen production during the extension of bee farming operations. The plants seem to respond to the efficient and intense work of the bees in nectar and pollen gathering. It seems quite in keeping with the ways of nature too.

Value of Observation on the Outside of the Hive.

Another inquiry recently made deals with the management of large apiaries with a minimum of labour in examination work. It is a matter of experience. The experienced man is able to tell from observation of the working force on the outside of the hive just what is the condition inside. He can thus save many general examinations and is able to manage larger apiaries in an efficient manner. It is quite logical that any trouble inside the hive must be reflected on the working force, and a walk around the hives should in most cases show which colonies require attention. We cannot, of course, do away with the general examination, but it can be cut down to a minimum. If a general examination is made during the spring and the condition of each colony is carefully noted, outside observation will show for quite a time afterwards whether the colony is doing as well as can be expected. If "dwindling disease" or

"paralysis" is present in the hive, the diseased bees will be clearly on view about the entrance. A colony weakened by brood disease (foul brood) must show a decline in the working force and have a listless appearance compared with the healthy stock; but, of course, where brood disease is present in the apiary a greater number of general examinations must be made so that the disease can be discovered and treated in its earliest stages.

If the colony is queenless there will be a slackening down in the work, and a lesser quantity of pollen being brought into the hive. Pollen, being chiefly used for feeding larvæ, will not be required to any great extent in a queenless hive. Exceptional progress and ever-increasing activity of the field bees during spring time gives warning that sufficient accommodation must be provided to minimise swarming.

The clustering of bees about the entrance when the hot weather comes on shows clearly that the bees require additional ventilation.

A honey flow is evident from the flight of the heavily laden bees. There is quite a difference in the flight of a bee with a full load of honey and one flying light. Then we have the odour of new honey about the hives—such a distinctive odour at times that the source of supply can be determined from it. There is quite a different sound—a low droning—about the flight of bees during a honey flow.

A further note of progress that is observable from the outside of the hive is the practice flights of the young bees. In a progressive apiary during the warm part of the day, thousands of young bees come out to try their wings, and sometimes the beginner considers that a swarm is issuing.

It may be seen thus, that not only is a good knowledge of the inside of the hive desirable, but observation from the outside is of much value too.

Weather Conditions and Nectar Secretion.

It is often noticed during dry times, when, although there is a good deal of flowering flora available for the bees, a very small quantity of nectar is secreted. Then a change in the weather with indications of rain coming will bring on a heavy secretion of nectar in the flowers. Sometimes the bees will be quite listless during the morning, and then in the afternoon during a changed condition they are all activity. If we look a little carefully into this phenomena we will see that nature has really made a very cunning move, for not only do the bees obtain an increased supply of stores previous to an inclement condition of the weather, but the plants also, by the activity of the bees, get an intense fertilisation of their seed. Had there been no inducement for the bees it may have been too late after the rain for the pollination to be effective.

We are fully aware of the benefits derived in nectar secretion from moisture, the effect of good rains, but what causes the flow during the change in the weather previous to the rain? Does the electrically charged atmosphere have some effect? It would appear so, for the condition is generally evident previous to a thunderstorm.

Poultry Notes.

August.

JAMES HADLINGTON, Poultry Expert.

At no previous time in the history of poultry-farming has so much attention been directed to size of eggs. Not that our eggs are smaller than in the past—as a matter of fact they were never on the average so large as now—but because of the fact that there is so much talk of grading "in the air." Even poultry-farmers themselves are hailing the grading of eggs as if their salvation depended upon producing eggs of great size, but while this is so, many are negligent of the factors responsible for the small egg.

The first of these factors is that many eggs under two ounces in weight find their way into the incubators—not that anyone wants to set small eggs, but in order that every possible egg may be turned into a chicken. This, of course, is the first step to the perpetuation of the small egg trouble. The moral is, "Don't set small eggs."

But the incubating of small eggs is not the only factor in their production. There are others. Loss of stamina and physique are the two main factors in pulling down the size of eggs. There are no surer signs of degeneracy in a breed or strain than falling off in this particular; therefore, undersized eggs should be as the writing on the wall to the poultry-farmer—a warning that his flock is degenerating. There is scarcely one of the many breeds that have become effete in which this did not precede its downfall.

Breeding, Feeding, and Environment.

It follows that every effort should be made to maintain a reasonable standard of size of egg. It is at hatching time—right now—when much can be done in this direction. If we would raise the standard of eggs in both size and quality we must attend to other features besides the rejection of small eggs. We must reject all undersized birds as breeders and attend to those factors dealt with in last month's Notes in respect of breeds. Then we must see to it that we secure good development in the chickens that are being reared. In this connection there are three prime factors: breeding, feeding, and environment. The last means, in this case, good brooding and good subsequent rearing conditions.

The main difficulty met with in connection with the first of these three factors is a disposition on the part of many farmers to attempt short cuts. In place of good breeding, for instance, they are apt to trust too much to reputed performances, and too little to actual value as seen in the birds themselves. There is only one remedy for this, and that is for every farmer to acquire a working knowledge in respect of quality of the breed he is keeping or is about to introduce to his yards, because what is not outwardly visible is not there, no matter what pedigrees are behind the birds.

The next factor is feeding. Here again, in place of feeding rationally on simple foods which universal experience has proved and experiment confirmed as efficient for all requirements, there is a tendency to follow every fad and fancy—often the product of some fertile brain totally devoid of experience on the subject of feeding chickens. Thus the cost of production is immensely increased without compensating values. Observations on this matter go to indicate that the cost of feeding chickens over a great part of the poultry industry is 20 to 30 per cent. higher than it would be were it possible to eliminate all superfluities from the ration. This is a serious matter in these times of high cost of feeding, and it will pay the farmer to revise his methods and return to the simple fare advocated in these Notes.

In this connection, too, remark is timely in regard to how long chicken mixtures and other expensive items in the ration should be continued. It is not necessary, nor even advisable, to continue to feed chicken mixtures, or in fact any special article of diet, beyond six weeks of age. How many feed chicks up to twelve weeks and even longer on baby chicken fare? Chickens of this age are quite able to eat whole wheat and cracked maize, but the reason why so many continue to feed chicken mixture is because they think the chickens are not equal to eating the whole grain. This is a mistaken notion, and its deceptiveness only becomes apparent when the change is made from the small ground grains and tit-bits in the mixture. The chickens naturally do not take kindly to the change. Hunger will no doubt bring them to it, but the effects of the change can be minimised by adding a little of the whole grain to the mixture for a while before feeding whole grain only.

With regard to the third item, brooding, one sometimes sees farms that are poorly equipped in regard to rearing plant, but where excellent results are obtained. Other farms come under notice where the equipment is almost all that could be desired, and yet there is failure to secure satisfactory results.

All this points to the fact that the personal equation is the prime factor in the rearing of chickens, and, further, the ability to rear chickens is the one great essential to successful poultry-farming.

Reduce Cost of Production.

In this connection it is becoming obvious that a close scrutiny of the relative costs of essentials, compared with practices which are coming more and more into vogue, would result in a considerable reduction in the cost of feeding. The same thing applies in a measure to rearing and the general equipment of the farms. If all the labour-saving devices now in use, which increase the cost of equipping a farm, do not result in economy and efficiency in rearing chickens and the handling of more stock per man on the farm, the cost of production is being largely increased. One sees farms equipped with all the latest labour-saving appliances, and yet actually running fewer birds per man than was the case under old methods.

In addition to the unnecessary and excessive cost of feeding, there is also appearing a kind of medicine craze. Just as soon as the chickens in the

brooders show signs of trouble, many farmers, instead of getting right down to the cause of the trouble (which in ninety-nine cases out of the hundred is due to errors in brooding), resort to some medicinal panacea. In the meantime hundreds of chickens are lost and the trouble (rather than the medicine) cures itself by thinning out the chickens. The medicine is then given the credit for effecting the cure, and so go merrily on the fads and fallacies that are increasing the cost of production and lowering the efficiency that should obtain on the farm.

It is not so many years ago when a poultry-farmer was fortunate to have a supply of water, in the shape of a water-hole on his farm, which would last but a dry spell. This was in pre-motor transit days, when the farmer was compelled to keep a horse, cart, and often a light vehicle in order to make the necessary connections with the railway or river depot for his produce. To-day poultry-farmers for the most part have the advantage of a town or city water supply on their farms. Their produce is picked up at the farm by motor lorries, and poultry food and supplies are delivered to them by the same agency. All these services have to be paid for, but the division of labour should lead to efficiency and economy, which, in other terms, means that they should enable the farmer to run more birds with less effort.

Savings, too, might often be effected in the purchase of foodstuffs. In the case of a farmer who has the wherewithal to purchase supplies ahead of requirements, a little business acumen will enable him to save money, while for those less fortunate in respect of their banking accounts co-operative purchase of foodstuffs will tend in the same direction.

Check the Weight of Chickens.

In September issue of these Notes last year, a list of weights was given as indicating fair progressive development.

Taking equal numbers of each sex, the following weights for age can be regarded as fair development for early to midseason hatched chickens:—

White Leghorns.

Age.	Weight.
28 days	6 to 6½ ounces average per chicken.
42 „	12 to 13 „ „ „
84 „	32 to 36 „ „ „

Orpingtons or Langshans.

Age.	Weight.
28 days	6½ to 7 ounces average per chicken.
42 „	13 to 14 „ „ „
84 „	48 to 56 „ „ „

These weights have sometimes been exceeded, particularly with early hatched chickens. Again, cockerels of all breeds will weigh heavier than the pullets, more particularly from six weeks onward.

Following upon this, the weights of a flock of September-hatched pullets which had been fed on the simple ration mentioned in "Rearing and Feeding"* were taken at eight months old, and the average weight was **4 lb. 10 oz. each.**

* The leaflet "Rearing and Feeding" will be supplied free on application to the Under Secretary, Department of Agriculture, Sydney.

Orchard Notes.

August.

W. J. ALLEN and H. BROADFOOT.

If winter ploughing has not yet been completed—and in many districts the copious and long continued rain has been a deterrent—it is important that every effort should be put forth to finish as soon as practicable. Early winter ploughing is strongly recommended, as the land is then put in the best condition to absorb winter rain, the soil is exposed to the beneficial action of frost, and the decomposition of vegetable matter ploughed in is completely accomplished. No prudent orchardist should neglect this important operation at the time when it will conduce to the fullest possible benefit.

Planting.

The planting of deciduous trees may still be carried on during the current month, but earlier planting is always desirable. The tree makes root growth long before it begins to put forth new leaves and branches, and it is important that a good root system shall develop before top growth makes its demands.

When planting pome fruit, such as apples and pears, and drupe fruit, such as plums and cherries, adequate provision should be made for cross-pollination. This will frequently save disappointment in the future.

Citrus trees may be planted in localities free from late winter or spring frosts, but where these are likely to occur it is advisable to defer the planting until all danger of frost is over. During some seasons a fairly long period of dry weather is experienced in the spring, which proves inimical to newly planted trees, but taking everything into consideration the balance is somewhat in favour of spring planting. Very much depends upon locality, soil, and aspect.

Pruning.

This operation may be continued during the current month, particularly in late districts. In the case of young trees the establishment of a good framework is of paramount importance; they should not be allowed to outgrow their strength or to commence cropping before the limbs can bear the weight of fruit. A slight present gain should not be sought at the expense of the robustness and vitality of the tree. In the case of older bearing trees, the characteristics of each variety should be studied, and it should be remembered that each tree of the same variety has a sort of individuality which cannot be profitably ignored. Only by giving close attention to the individuality of each tree and treating it accordingly can

the best results be obtained. For treatment of some of the chief varieties as separate units, each requiring individual treatment, reference may profitably be made to the Orchard Notes in last month's issue.

Cherry and Peach Aphis.

The aphis attacking the above varieties of fruit trees did a considerable amount of damage last season, and every effort should be made to keep this pest in check. Aphis not only interfere with the coming crop, but they also affect the following one, while their attacks have a tendency to stunt and twist the tree in its growth. The trees should receive an application of oil as late as possible before the buds burst in spring. The work must be thoroughly done, and a good force is necessary to break up the aphis clusters. If the work is carelessly performed it is time and labour wasted, as the pest multiplies so rapidly that nothing is of much value to stop its spread if it is not applied correctly and thoroughly at the right time. The spraying of oil should be followed with an application of nicotine extract as soon as the trees commence to shoot.

Cherry growers should watch very closely for cherry aphis, and it is advisable to spray with oil before the buds burst in spring, and to follow, in this case also, with an application of a nicotine extract after the trees commence to shoot.

Manuring.

This is a good time to give citrus trees a dressing of fertiliser, except in the cases of sulphate of ammonia or nitrate of soda, which should not be applied until September. Deciduous trees as well as citrus benefit very much from an aplication of farmyard manure, and where it is available growers should apply it to their trees.

Grafting.

Toward the end of this month grafting may be done in many localities. Any undesirable variety may be worked over to a desirable kind. In grafting upon old trees numerous grafts should be inserted. This aids in the maintenance of healthy tissue round the whole limb. If only one or two grafts are placed on the outer ring of large limbs, the inside portion of the limb invariably dies back and the death of the whole limb or even of the whole tree sometimes eventuates. A bulletin on budding and grafting may be obtained upon application to the Under Secretary, Department of Agriculture, Sydney, price 10d. post free.

Leaf Curl.

The spraying of peaches with lime-sulphur or Bordeaux should receive attention, if not already carried out, as leaf curl exacts a heavy toll if precautionary measures are not taken. Both of the sprays mentioned have proved efficacious in keeping leaf curl in check. Growers should always see that sprays are properly mixed and applied thoroughly. Carelessness in this matter may result in heavy losses.

Rejuvenation of Old Peach Trees.

In some orchards where peach trees have become somewhat stagnant, the growth poor and fruit small, and where the trees have lost practically all the lateral growth on the lower portions of the limbs, it is advisable to give a hard cutting back in order to stimulate new growth, out of which new leaders may be formed. Of course, if satisfactory results are to be achieved the tree must have a good root system, and healthy butt and limbs. It is impossible to get the best results by cutting back peach trees which are sick as a result of attack by *Armillaria* or white ants, or any other such cause. The cutting back should be done just before the trees start to make growth in the spring. The limbs should be removed about three or four feet up from the crown, as if they are cut close to the crown a big cut is made exposing a large surface which does not heal up satisfactorily, and decay will generally set in soon after the cutting is done. By coming higher up the limb, the cut is smaller and leaves a greater length of the old limb, from which new shoots may develop.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society and Secretary.	Date.
Condobolin	Aug. 17, 18
Gilgandra (D. Christie)	„ 24, 25
Wagga (F H. Croaker	„ 24, 25, 26
Bogan Gate (J Egan)	„ 25
Cootamundra (W. W. Brunton)	„ 31, Sept. 1
Grenfell (T. Weneham)	„ 31, „ 1
Parkes (L S. Seaborn)	„ 31, „ 1
Albury (A. G. Young)	„ 31, „ 1, 2
Junee (G. W. Scrivener)	Sept. 2, 3
Forbes (E. A Austen)	„ 7, 8
Coolamon (J. H. Seymour)	„ 7, 8
Young (T. A. Tester)	„ 7, 8, 9
Gunnedah (M. C. Tweedie)	„ 7, 8, 9
Lake Cargelligo (J. Costella)	„ 8
Ganmain (C. C. Henderson)	„ 14, 15
West Wyalong (T. A. Smith)	„ 14, 15
Cowra (E. Todhunter)	„ 14, 15
Manildra (J Longley)	„ 14, 15
Singleton (S. Griffiths)	„ 15 to 18
Melbourne	„ 16 to 25
Lockhart (E. D. Arnold)	„ 21, 22
Murrumburrah (W. Worner)	„ 21, 22
Canowindra (J. Rhue)	Sept 21, 22
Temora (A. D. Ness)	„ 21, 22, 23
Boorowa (W. Thompson)	„ 22, 23
Henty (J. Lovell)	„ 28, 29
Barellan (J. Doherty)	„ 29
Barmedman (W. Pemberthy	„ 29
Eugowra (F E Hill	„ 29
Hillston (J. Pevers)	Oct. 1
Corowa (J D. Fraser)	„ 1, 2
Cudal (H. W. Ford)	„ 5, 6
Ardlethan (R L. Neill)	„ 6
Quandialla (V. G. Talbot)	„ 6
Hay (R. Eager)	„ 6, 7
Narrandera (W. H. Canton)	„ 12, 13
Ariah Park (J. McInness)	„ 13
Carcoar (J. Brady)	„ 13
Millthorpe (T. P. Smith)	„ 19, 20
Griffith (M. E. Sellin)	„ 19, 20
Deniliquin (P. Fagan)	„ 19, 20
Lismore (H. Pritchard)	Nov. 16, 17, 18
Murwillumbah (T. M. Kennedy)	„ 24, 25
Coramba (H. E. Hindmarsh)	„ 30, Dec. 1

1927.

Dapto (E G. Coghlan)	Jan. 14, 15
Kiama (G. A. Somerville)	„ 25, 26
Wollongong (W J. Cochrane)	„ 27, 28, 29
Tahmoor (E. S. Key	Feb. 11, 12
Newcastle (E J. Dann)	„ 15 to 19
Blacktown (J McMurtrie)	„ 25, 26
West Maitland (M. A. Brown	March 2 to 5
Moss Vale (W. Holt)	March 3, 4, 5
Glen Innes (G. A. Priest)	„ 8, 9, 10
Taree (R. Plummer)	„ 9, 10, 11
Campbelltown (W. N. Rudd	„ 25, 26
Camden (G V. Sidman)	„ 31, Apl. 1, 2
Sydney Royal (G. C. Somerville)	April 11 to 20
Grafton (L. C. Lawson)	May 4, 5, 6, 7

VOL XXXVII. PART 9. SEPTEMBER 1, 1926

Agricultural Gazette of New South Wales.

Recollections of Lambrigg.

J. T. PRIDHAM, H.D.A., Plant Breeder.

WITH the object of keeping Farrer's name green in our memories, some reminiscences of a three years' apprenticeship in wheat breeding at Lambrigg are here jotted down.

Leaving the train at Queanbeyan, one started after breakfast on a 16-mile drive by the mail coach to Tharwa, passing Duntroon plain where the Military College now stands. Nearing Tharwa one caught sight of the stately poplars on Cuppacumbalong on the other side of the river—Mrs. Farrer's old home. The Murrumbidgee is here fringed with willows, and winds considerably. Some miles further down, the banks are steeper and the hills draw closer in with she-oaks instead of willows. A buckboard buggy took the passenger and mail three or four miles on to Mr. Farrer's house, which stood on a slope that gave a view of the river. The country is mostly granitic, and Canberra lay a few miles away on the opposite side, Lambrigg itself being within Federal Territory. At a height of over 2,000 feet above the sea, the climate was delightful, and though situated in hilly country suited for sheep rather than cultivation, the somewhat thin, shaley soil of the historic wheat paddock was well adapted to Farrer's objective. This was to raise wheats capable of thriving in dry soils; on this tableland district the average annual rainfall would not be much more than 22 inches. The little paddock of six acres lay near the river, a few hundred yards from the house, with a pisé laboratory of three small rooms in one corner. The largest of these was Farrer's office and workroom, the second a bunt-infecting chamber, and the third a bedroom.

Seed of all the unfixed crossbreds was well smutted with broken bunt balls before being sown, with the object of raising a smut-proof wheat. The yields of grain were light, but comparable results were obtained and the conditions favoured rapid ripening, which enhanced the quality of the grain —an objective which Farrer always had in view. A large collection of macaroni wheats was grown, and some beautiful samples of clear amber grain were produced, but the production of this class of wheat has failed to take on in this country, though these wheats may find their place in blends for breadmaking as they have done in America.

The only occasion on which irrigation was resorted to, so far as I am aware, was in the 1902 drought when the crossed plants were watered from a tank on a cart. That year we saved the wheats but the yields were light, on account of the drought and also of the parrots which congregated from the whole neighbourhood, there being so little crop in the district.

In 1901 Federation was given its name, and the crossbred then struck one as showing very wheaty looking growth. Rye was sown for winter grazing and a fine crop of rye and tares was grown one year on the fallow, the paddock being alternately in wheat and fallow. If grazed and finally cut for hay before the stems get harsh, rye is a most useful crop in such country, though oats take its place under better conditions.

Mr. Farrer was interested in fruit growing and a rather large collection of varieties, especially of apples, grew in his orchard. He concentrated on wheat, however, maintaining that there was enough in one crop plant to absorb all one's energies. So the orchard and vegetable garden were left for times of relaxation. He tested vegetable seeds, importing new sorts from abroad from time to time. The melons were of special interest to his

The Flats at Lambrigg.

The wheat paddock is on the right, behind the fence. The tiny shelter for tools, &c., may be seen in the middle of the paddock.

young relatives. His hospitality and kindness of heart were not hidden by the reserve and sensitiveness of his disposition; and many were the guests at Lambrigg. The breeding activities with wheat earned him a varied reputation. Correspondents, notably in America, England, India, and France, appreciated something of its value. Some of his friends thought it a harmless hobby, while a neighbouring farmer, in common with a few others, had given him up as crazy. The farmer referred to was a more likely subject, as he went about among his sheep talking aloud to himself.

Though Farrer's system was not elaborate, and though explanatory notes and comments were largely wanting in his records, every wheat could be traced back to its source and the histories and pedigrees studied. Close attention to detail and exactness in recording marked his methods. At my first introduction to the work a question was asked in regard to reading; to which he replied that field observations were of more value than literature.

Darwin's "Variation of Animals and Plants" was a book he recommended, and this, with the American bulletins, was my foundation in plant-breeding. The dictum was early laid down that the individual plant was the basis of all variation and therefore of improvement; however similar two plants appeared to be they were not to be threshed together. Of course after the selected individuals had been harvested the remainder were bulked together, and in some cases were tested in a laboratory mill in Sydney by the Department for their qualities as flour.

Farrer's work differs from that of most others in this line in that yielding capacity was not his prime object. A variety of any promise, when fixed, was handed over to the experiment farms to be tested for yield. To give his own words, writing in 1899: "I am engaged in an effort to make varieties or strains of varieties to suit all the districts of our interior—the hottest and driest included—and to produce grain which in grading can be placed in one or the other of two distinct classes. These will consist of (1) varieties with

The Wheat Paddock at Lambrigg.
The building that is so prominent is the Laboratory.

all the characteristic excellences of the very best of the old South Australian sorts, but yielding stronger flour, (2) varieties which are equal to the very best grown in Minnesota or Manitoba in flour strength, but with mellower grain and of better appearance."

These aims he pursued to the last, viewing wheat production from the point of view of the consumer. He says further: "While a 200-lb. bag of Purple Straw or Wagga White Lammas of the harvest of 1897, when they both showed a flour strength of 45, would only make about 278 lb. bread, a bag made from the same year's growth of Jonathan with a strength of 68, would make about 329 lb. There can, therefore, be as great a difference between the intrinsic values of wheats as there is in the work turned out

by different tradesmen. I expect, therefore, before long to see many of our farmers taking as much pride in the value of the grain they grow as a good tradesman does in that of the work he turns out." This hope has not been realised because wheats of high flour strength yield only moderately, and an enhanced price for their grain is not obtainable. Were the public to demand a loaf as rich in nutrients as macaroni, the strong wheats would be in demand. The advent of grain silos, however, has been a step towards the grading of wheat, and it seems only a question of time when wheats of higher flour strength will be more used for blending and will command a better price, such as will pay the farmer.

A General View of Lambrigg.
The residence is on the right.

The wheat varieties grown at Lambrigg comprised numbers of foreign sorts as well as our own. The most valuable for crossing purposes proved to be Indian and Manitoba sorts, combined with the various strains of Purple Straw. The latter wheat is probably a sport from an English variety; its origin is not certainly known. English wheats have not been satisfactory as hybrids as a rule. Mr. Farrer spent much time comparing the pedigrees and considering the mating of individuals and their relative adaptability, like a prize pigeon breeder quoted by Darwin who always deliberated for several days before he matched each pair. Though a vast number of crosses was made each year, only a few selections from each could be sown in the acre and a half devoted to the plots. The complexity of the pedigrees was often considerable, one of the most lengthy being that of Union in which thirteen distinct varieties were included, some more than once. The last

mating which produced this wheat was made at Cowra since Mr. Farrer's death. Federation is the greatest triumph he achieved, and though by no means impressed with its grain qualities he felt that it should be brought into cultivation because of its high yield.

Every spring an extended tour of the experiment farms was made to inspect plots where crossbreds were being tested and new sorts fixed for local conditions, Lambrigg being reached again in time to start crossing operations for the season. Often before leaving home on this trip he would cut back any parent plants which in his judgment would come into ear too early for crossing purposes. This had the desired effect of retarding the flowering stage, so that the pollen could be used on his return. During the crossing season he would be down in the paddock an hour or two before breakfast, continuing the work till midday. The long afternoon would be occupied with note-taking, selection, and preparing for next day's crossing. The final selection and harvesting, following in warmer weather, was rather exhausting for one never very robust in health, but the days never seemed too long or arduous for this enthusiastic worker.

These notes would not be complete without reference to Mrs. Farrer, whose encouragement and devotedness must have been a solace to her husband, and whose unfailing kindness to others won her the expressive and warm bush compliment of "a white woman."

Our Heritage of Trees.

One hundred and thirty years ago New South Wales was a well-timbered country, possessing huge areas of virgin forests, which if available at present prices would pay our national debt many times over. The story of the early history and development of forestry and tree culture in this State is not an attractive one; on the whole it is a sad story of destruction and spoliation. . . . Our forests are a gift of nature for man's use and benefit, and by conservative management can be made to serve the needs of both the present and future generations. Conservation as a policy means wise use and systematic replenishment, and the lesson of history is that forest preservation and national prosperity go hand in hand.—J. J. McLeod, Senior Forester, at the State Conference of the Agricultural Bureau.

The Farmer's Unledgered Income.

Studies of more than 7,000 farms well scattered over the United States and representing various types of agriculture show that the value of that part of the family living which is obtained from the farm roughly approximates one-ninth of the farm receipts and one-third of the net income, and that even in years when the money margin shows a deficit this unledgered income is able to maintain for the farmer a reasonably contented state of mind.—*The Banker-Farmer.*

The Advantages of Top-dressing Pastures.

The top-dressing of pastures with a phosphatic manure, preferably superphosphate, is essential to stockbreeders, particularly dairy farmers, for the following reasons :—

1. It increases the mass of fodder on a pasture by at least two and a half times.
2. It improves the quality, by specially stimulating the leguminous plants.
3. The soil is enriched, due to the greater production of manure relatively richer in nitrogenous compounds than heretofore.
4. All growing stock and milk cows require large quantities of lime and phosphoric acid for the maintenance of health and milk production. These elements are present in leguminous plants in relatively large quantities.
5. The composition of fodder so fertilised is changed, particularly the composition of leguminous plants. This change, regarding the mineral content, is in the direction of more lime and phosphoric acid.—G. K. Baron-Hay, in the *Journal of the Department of Agriculture*, Western Australia.

Pasture Improvement and Animal Health.

Probably much more than a third of the loss of stock by disease is traceable to food shortage and diet that is in some way deficient. The substances of which there is most frequently a deficiency are lime and phosphorus. In showing the farmer how to grow good quality pasture and getting him to top-dress with superphosphate, the Agrostologist of the Department is really indicating to him how he may safeguard his stock, in the first place by providing the animals with a properly balanced diet, and secondly by repairing any deficiency in the direction referred to. The tendency in the past has unfortunately been to "eat the country out." Every pound of meat and milk that is taken off the farm should be put back in another form, but in practice it is very seldom put back. If the animal does not get the requisite amount of lime and phosphorus in its diet it will utilise its own tissue, and eventually develop the symptom known as bone-chewing. Botulism is an indirect result of depraved appetite caused by a diet that is deficient, the animal eating perhaps infected carcases in its extremity in an instinctive effort to make up the lime and phosphorus lacking in its food. Another way in which the Agrostologist tends ultimately to help the Stock Branch is in the reduction of the grass seed trouble by the provision of better class pasture plants.—Max Henry, Chief Veterinary Surgeon, at the State Bureau Conference.

A Neglected Aspect of the Weed Problem.

In the past far too much emphasis has been given to the menace that large areas of any particular weed may exercise in the invasion of clean land, and too little emphasis to the practices that must be adopted in order to keep clean land clean. A better knowledge and better application of the principles involved—all of which are connected with pasture maintenance and improvement—would do much towards the solution of the weed problem in connection with our grass lands.—A. H. Cockayne, in the New Zealand *Journal of Agriculture.*

Parkes District Educational Tour.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

THE prosperity of a district which depends upon primary production is largely governed by soil fertility and climatic conditions, but as years pass the human factor becomes of greater importance in ensuring consistently progressive returns. Stability is all important, and it takes years of steadily improving results before a district can justly claim to be really prominent in that class of production in which its farmers are interested.

It is with a desire to demonstrate what has been learnt by steady and persistent effort that the people of Parkes district and town are promoting the Parkes District Educational Tour.

The Parkes district has land that is unsurpassed for wheat and fat lamb production; it has climatic conditions that, with the exercise of a little forethought, are quite safe; and it has highly qualified farmers who are practising the best of methods, and who are therefore adding to the reputation and the wealth of the district. The prosperity of any part of the State, however, is bound up with the whole, and the farmers of the district and the promoters of the educational tour, hope that all will benefit by the exchange of knowledge which the tour will facilitate.

The tour will take place on Tuesday, Wednesday, and Thursday, 5th, 6th, and 7th October, and accommodation and other arrangements are being made for 200 visitors.

Railway concession fares will be available, but visitors will have to pay their own hotel expenses. Car transport will be provided free of cost by local residents.

On the morning of the first day a civic reception will be tendered the visitors, who will then be afforded opportunity of seeing the town and business places. Following this, country inspections will commence, and will be continued on the second and third days, all the country within a 20-mile radius of the town coming under review.

Inspections will be made of pure wheat seed areas, variety trials of wheat and oats, manurial trials, rate of seeding tests, crops grown on the fallows that occupied leading positions in the late fallow competition, many field crops of wheat and oats, studs and flocks of sheep, fat lambs, pasture improvement, fodder conservation, &c.

Picnic lunches will be provided by members of local branches of the Agricultural Bureau on Wednesday and Thursday. Evening sessions will afford opportunities for addresses by officers of the Department of

Agriculture, prominent local farmers and others on practical primary production problems.

It is purposed that the visitors shall not only include wheat and sheep men from other parts of the State, but that commercial and other interests directly interested in the products of the soil will be represented. Representatives of the Government, officers of the Department of Agriculture, representatives of banks, commercial houses of all kinds, newspaper, rural associations, and so forth, are being invited.

Marked progress has been made in recent years in the systems of primary production practised in the district—mainly owing to the co-operative efforts of the branches of the Agricultural Bureau and the Parkes Pastoral, Agricultural, and Horticultural Association, the Bureau stabilising experimental and demonstrational areas in crop production, and the Association focussing attention on successful methods by field competitions. The tour should therefore afford educational material of great variety for all who avail themselves of the opportunity Parkes people are offering them.

The organisers suggest that intending visitors should immediately advise the secretary, Mr. C. C. Brownhill, Parkes, stating whether hotel accommodation and seats in touring cars are required. If railway concession fares are desired, that should also be stated, and the station named from which the journey will be commenced.

Feeding Buttermilk to Pigs.

A Bellinger River dairy farmer, who addressed the Department on the above subject, was answered to the following effect:—

Buttermilk has approximately about half the food value of skim milk. Both maize and pollard would be suitable concentrates to add to buttermilk in order to furnish a balanced ration. As maize can be grown on the farm, and pollard would doubtless be comparatively more expensive in the Bellinger River district, therefore, it would be advisable to use the former.

Maize should be ground prior to feeding in order to facilitate its digestion, as well as to prevent whole grains being voided in the faeces of the animals. About 3 lb. of ground maize daily should be added to the liberal milk ration of pigs about two months old, and the allowance of grain must be increased with the age of the pig. When pollard is used, enough should be added to make the feeding mass of a fairly thick creamy texture.

Rape is an excellent food for pigs of all ages, as it is palatable and gives a rapid production of flesh. In order to achieve best results with this crop, the pigs might be grazed on it between the morning and evening ration of milk and concentrates.

Saccaline may be used to furnish a change of diet, but as it contains a large proportion of dry matter which the digestive organs of pigs cannot assimilate, it is not so valuable a fodder for them as it is for cows.—P. Waller, Senior Dairy Instructor.

The Newer Varieties of Wheat.

Descriptive Notes of a Few.

[Continued from page 583.]

J. T. PRIDHAM, H.D.A., Plant Breeder.

Canberra.

THE young growth is rather erect, the leaves medium dark green, somewhat glaucous, and medium broad. The straw is of medium height, hollow, white, and rather slender. It stools fairly, with a moderate quantity of erect leaves. The ears are smooth, light brown, half erect, slightly awned at the tip, of medium length, open and uniform with an acute tip. The spikelets are irregular and medium to widely spreading with medium sharp-pointed glumes, which are not firmly attached. The grain is of medium size, slightly elongated, yellow, opaque, with a medium deep crease.

The variety is the result of an attempt made at Wagga Experiment Farm to produce a hybrid between Federation (the dam) and Volga barley, a two-rowed sort obtained as an impurity in a sample of wheat received from Russia. That the attempt was successful has always been a matter of doubt, however, for while it behaved from the start like the progeny of a violent union (say, of two widely diverse races of wheat), no barley characteristics have ever been seen in it. Probably the variety is the result of accidental cross pollination with another wheat. It has been suggested that a Durum wheat may have been the male parent, but no Durum varieties in the same paddock came into flower until two days after the cross was made. It was named at the 1914 conference of departmental officers, and has since become a highly popular variety in a large portion of the wheat belt.

It ripens quite as early as Thew, and is very useful as a quick maturing variety for grain throughout the wheat belt. It is somewhat weak in the straw, but it is such a heavy yielder of grain that it deserves the attention it receives from growers, notwithstanding its liability to lodge under growthy conditions. In the north-west it should not be sown on the black and heavy soils. In the Riverina and South-western Slopes it has been thoroughly tested on the experiment plots, and has proved its superiority over all other early maturers as a grain producer. It has easily outyielded Bunyip in practically every instance, and has practically displaced that variety. It is important that Canberra should not be sown until the latter portion of the sowing season, otherwise there is a tendency for it to lodge.

It yields a high percentage of flour, which is of excellent colour and belongs to the "Medium Strong" class.

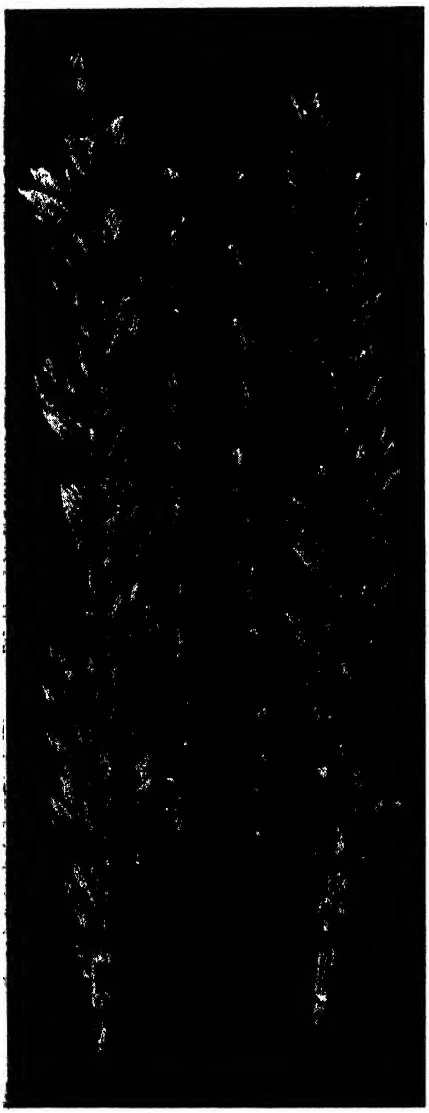
Canimbla.

Like Cadia, Canimbla is adapted to the cooler districts or country with a fairly good rainfall. Stooling well, with dark-green flag and straw of tall to medium height, it matures at the same time as Cadia. The tip-awned

brown ear has a look of Federation, but the yellow grain is more plump and flinty in appearance, and a well-grown sample is very handsome. Canimbla resulted from a cross made at Cowra between Hard Federation and Cleveland, and yields well for both hay and grain.

Cargo.

Cargo is a mid-season to late variety suiting the Central Tablelands and parts of the Riverina. The tip-awned white tapering ear holds its grain fairly well, and the white straw is tall and of good quality. The grain is



Canberra.

Canimbla.

yellowish white, large and particularly attractive in appearance, yielding medium strong flour. Cargo has a good proportion of the old Australian Talavera in it, the pedigree being:—

Fife Indian x Talavera cross

Cleveland x Talavera — Gilgandra x 9 (F)

Unnamed — Unnamed

Cargo

Chant's Prolific (or Dart's Imperial).

This is a wheat resembling Penny, and is grown in parts of the western districts and Riverina. A good general purpose wheat like Penny.

Clarendon.

The chief value of this wheat lies in its comparative freedom from rust and its early maturity. Adapted for the north-western, western plains and coastal districts, where moderate yields are preferable to crop failures (more or less) from drought or rust. Clarendon it an erect grower, and rather sparse stooler with somewhat scanty foliage. The white, tapering ears are slightly tip-awned, and the chaff stands rather open, allowing bleaching of the grain. It occasionally shatters, but not nearly so much as Florence. The straw is white, of medium height, and not coarse. The grain is white, rather small, and medium hard. Clarendon ripens with Canberra, but is more suitable for fodder and hay than for grain production. It is one of Farrer's crosses, the pedigree being as follows:—

Eden x Jondhala

Jonathan — Unnamed

Gluyas — Unnamed

Bobs — Unnamed

Clarendon

College Purple.

College Purple originated with Mr. H. Pye, of Dookie College, Victoria. It ripens with Yandilla King, and is a general purpose wheat. The tip-awned white compact ears are clubbed and look productive. The somewhat

purple straw is of medium height, but brittle, and loss is occasioned in windy weather by heads snapping off. The yellow grain is of medium size and yields weak flour of good colour. College Purple strips well, and is a productive variety sometimes grown in crop competitions.

Currawa.

A late maturing variety and somewhat resistant to both drought and rust, being grown more in the Riverina than anywhere. Its clubbed tip-awned white ear holds its grain satisfactorily. Currawa strips and yields well, though in some seasons the short, stout straw breaks down, as it has thin

Clarendon.

Currawa.

walls like Bunyip. The large white grain is in the weak flour class and often shows a black spot at the germ end. One of Mr. Pye's crossbreds, the pedigree is as follows:—

Northern Champion x Cretan

Unnamed x Little Club

Currawa

(*To be continued.*)

SULPHUR AS A FERTILISER.

EXPERIMENTS carried out at Glen Innes Experiment Farm to test the value of sulphur as a fertiliser have not given encouraging results. Sulphur alone, and in conjunction with superphosphate, was tested on oats. The plots (each measuring one-tenth of an acre, and sown in duplicate to obtain hay and grain results) consisted of the following:—

1. Unmanured (check).
2. 1 cwt. superphosphate per acre.
3. 1 cwt. sulphur per acre.
4. Unmanured (check).
5. 1 cwt. superphosphate and 244 lb. sulphur per acre.
6. 1 cwt. superphosphate and 244 lb. sulphur per acre.
7. Unmanured (check).

The only plot to show a gain in cash terms was that to which 1 cwt. of superphosphate had been applied.

The high cost of sulphur precludes its use as a manure except in the case of enormous gains, which have not resulted here, and although the tests proved that sulphur in combination with superphosphate produces more than superphosphate alone, the cost of the sulphur invariably outweighed the small gain obtained.

The results of the application of 1 cwt. of superphosphate to White Tartarian oats, compared with those from 1 cwt. superphosphate and 244 lb. sulphur, may be of interest:—

	Yield per acre.	Increase.	Value of Increase.	Cost of Increase.	Gain or Loss.
	bus. lb.	bus. lb.	£ s. d.	£ s. d.	£ s. d.
1 cwt. superphosphate ...	33 20	7 19	1 17 4	0 6 0	Gain 1 11 4
1 cwt. super., 244 lb. sulphur	33 36	10 35	2 14 4	3 15 8	Loss 1 1 4
Checks (no manure) ...	26 1	......	.. ..	....	.. .. ..

The values used in calculating the commercial result were:—Superphosphate, 6s. cwt.; sulphur, 32s. cwt.; oats, 5s. per bus.

In the hay trial the results were relatively the same. Superphosphate alone showed a gain of £2 6s., and 1 cwt. superphosphate and 244 lb. sulphur a loss of £1 18s. 2d. Sulphur alone during the trials has very seldom equalled the unmanured checks, and only once exceeded the checks.—H. H. ANDREWS, Experimentalist, Glen Innes Experiment Farm.

Farmers' Experiment Plots.

MAIZE TRIALS, 1925–26.

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

MAIZE variety and fertiliser trials were confined to the Singleton, Tamworth, and New England sections of this district last season, the following farmers conducting plots:—

F. Wild, Dangarsleigh.	D. Marshall, Red Range.
J. W. Jay, Ben Lomond.	R. Ward, Carrowbrook.
M. H. Johnson, Sunnyside.	J. Monkley, Redbourneberry.
W. Lye, Loomberah.	J. Garland, Mt. Olive.
R. Fulthorpe, Kentucky.	J. Moss, Mt. Olive.

In the northern portion, comprising New England from Armidale to Tenterfield, the elevation is from 3,000 to 4,500 feet, and, except in the case of the level low-lying portions at the higher elevation, the soil and climate are suited to the profitable production of maize for grain. The season was marked by excessive rains in early summer, which prevented the cultivations necessary to destroy weeds, and the omission was responsible for a considerable reduction in yield. The most prevalent weed, *Amaranthus paniculatus* (known locally as Boggabri), is difficult to eradicate, as seeds will germinate in the soil from spring to autumn, and some apparently take much longer. Good yields were obtained throughout New England in the rich basaltic and alluvial soils, where the weeds were kept in check. Cob rot was the only disease present, and this was not seriously in evidence. From Tamworth south the light rainfall towards the end of 1925, together with the hot conditions (at Singleton the temperature from 12th to 14th December ranged from 106 to 117 deg. Fah., the hottest December for twelve years), followed by a very dry spell to mid-March, caused little grain to be produced. On alluvial soils ploughed during autumn to early spring, there were instances of vegetative growth up to 10 feet high, with an average of 20 tons of green fodder per acre. This fodder was available at the time of acute shortage of natural herbage. Green maize was very valuable for sustaining the milk supply, and there is no doubt a greater acreage will be sown next season. For the past three seasons maize for grain has not as a rule been profitable south of New England, but for early autumn fodder for dairy cows it holds a leading position.

Details of the Plots.

Dangarsleigh.—Uplands, sloping to east; deep, self-mulching black loam of basaltic origin. Cropped 1924 with wheat (unmanured) for hay, yield 4 tons per acre. Stocked with sheep until ploughed late July 6 inches deep; harrowed 3rd September, ploughed 10th September, and harrowed and

rolled 18th September; sown 3rd October, in drills 3 feet 9 inches apart ploughed out to 3 inches deep, fertiliser applied by hand, grain by machine set to sow single grains 15 inches apart; seed covered by harrows 2½ inches deep. A dry westerly wind was blowing during seeding, causing drying out of the soil and subsequent uneven germination. A heavy rain storm shortly after sowing washed out a quantity of the seed, and the stand as a consequence was thin (allowance was made for this in computing the yield). On 13th January the maize was 5 feet high in tassel and with cob developing. Inter-row cultivation was performed five times, with a two-row cultivator, until the crop was 4 feet high. In mid-January weaner sheep were turned into it to keep weeds (mainly wild oats) in check; the crop then averaged 5 feet in height and was in different stages of development of tassel and cob. As on previous occasions, no damage was done by the weaners to the green maize crop.

RESULTS of Variety Trial.

Variety.	Dangarsleigh.	Ben Lomond.	Sunnyside.	Loomberah.	Red Range.	Carrow brook.
	bus.	bus.	bus.	bus.	bus.	bus.
Wisconsin Early	50	...	...	...	36	...
Funk's Yellow Dent	42	...	37	25	41	28
Funk's Ninety-day	37	...	...	19	...	...
Wild's Yellow Dent	54	...	...	...	...	...
Gold Coin	50	...	...	...	54	...
Golden Superb	46	48	36	...	45	...
Wellingrove	50	49	33	30	42	...
Smutnosed Flint	...	22	...	...	...	...
Goldmine	...	61	...	...	...	...
Golden Glow	...	52	35	...	39	...
Iowa Silvermine...	...	...	36	30	...	35
New England White Cap ...	...	...	38	...	48	...
Eureka	...	...	37	...	...	...
Kennedy	...	...	...	31	...	35
Leaming	...	...	...	19	...	...
Fitzroy	...	...	...	10	...	45
Auburn Vale Hogan	...	...	...	26	...	...
Jacobs	...	...	...	17	...	...
Red Hogan	...	...	...	...	...	32
Rose's Golden Surprise ...	...	...	...	...	...	41

The variety Coodra Vale made a very poor stand and was discarded. Wild's Yellow Dent made the best stand; it is locally considered a feature of this variety to produce a high percentage of plants from seed. The earliest maturing variety was Wisconsin Early, which on 21st April was the only variety except Wellingrove safe to thresh and bag. Gold Coin comprises an early and late type; it was the latest to mature. All varieties produced grain satisfactorily.

Ben Lomond.—Uplands, sloping to south and west; red loam of basaltic origin. Cropped 1924 with green peas (unmanured), harvested by 24th December. Residues ploughed under 7 inches deep 4th July, harrowed

twice, 20th September, and again just prior to sowing on 6th October. Drills ploughed 3½ inches deep and 3 feet apart, and two grains dropped every 3 feet in rows. Seed-bed moist when sown; seed covered 2½ inches deep by harrowing. Some plants did not appear till fourteen days after others, this causing uneven maturing. Several inter-row cultivations were given up to the time the cobs were well formed. A good even stand and growth resulted. All varieties had matured sufficiently to harvest on 13th April, and were fit to thresh a month later. Smutnosed Flint was first to mature (about a month earlier than the others). It proved a weak-stemmed and shallow-grained variety. A local strain of Goldmine was about a week later than the other varieties. It has been a consistently good yielder; a yield of 75 bushels per acre was obtained last year on Mr. Cregan's farm.

There was no noticeable difference in time of maturity between the various plots in the fertiliser trial, but the grain was drier and shelling easier in the M13 section. The distance apart of the rows on this plot (3 feet) would be too close for grain production at a much lower altitude, say, in the Singleton and Tamworth districts. Apart from the moisture factor, it may be that the clearer atmosphere on the Tableland and the consequently greater penetration of light may permit of closer spacing.

Sunnyside.—Uplands situation, sloping gently to the north; granitic sandy loam with clay subsoil a foot from surface; a crop of maize (unmanured) had been grown on the land in 1924. Ploughed 5 inches deep 2nd September and again 10 inches deep at the latter part of the same month, springtoothed 6 inches deep 1st October and harrowed, and sown with two-row seeder about 3 inches deep in rows 3 feet 9 inches apart; subsequently harrowed and interrow-cultivated four times up to 7th December. Germination and growth were uneven. Eureka made tallest growth and was least lodged when mature, only about 1 per cent. going down. All grew in excess of 5 feet and in all varieties but two the grain was dry and ready for shelling by the first week of March. Eureka was ready a week later and Funk's Yellow Dent by the end of the month.

Loomberah.—Level country; deep, black sedimentary, self-mulching loam; previous crop wheat (unmanured) in 1923 (a 15 bushel crop.) In October, 1924, a dense crop of thistles and trefoil was ploughed in while green 6 inches deep with disc plough. Cross ploughed 4½ inches in January, 1925, again in May (both operations to destroy weeds) and harrowed; harrowed 15th July, cultivated with spring tine 27th July 3 inches deep; harrowed 9th August. Sown 30th September, when moisture was plentiful, at 3 inches deep, rows 4 feet apart, single grains dropped in rows 1 foot to 15 inches apart. Plots unmanured. The seed was covered by ploughing in. A poor strike resulted, quite 50 per cent. of the seed failing to produce plants. The vacant spaces were re-sown at the latter part of October, when a satisfactory germination occurred; the plants from this latter sowing made little cob and grain development. The crop was harrowed when 9 inches high and subsequently

interrow-cultivated three times. On the early sown portion the grain was well developed on 23rd January. Funk's Ninety-day matured earliest, followed by Auburn Vale Hogan. All cobbed satisfactorily and were fully mature by 29th March.

RESULTS of Fertiliser Trial.

Fertiliser per acre.	Dangarsleigh.	Ben Lomond.	Sunnyside.	Red Range.
	bus.	bus.	bus.	bus.
*M4 ... 60 lb.	...	...	36	...
98 lb.	47	...	...	...
196 lb.	...	69	...	53
*M8 ... 80 lb.	...	...	35	...
252 lb.	...	...	...	71
*M11 ... 68 lb.	...	...	39	...
105 lb.	47	...	...	...
210 lb.	...	61	...	69
*M13 ... 53 lb.	...	...	35	...
91 lb.	52	...	...	...
182 lb.	...	66	...	...
186 lb.	...	...	...	75
Superphosphate, 47 lb. ...	...	...	44	...
70 lb. ...	47	...	...	...
112 lb. ...	...	...	44	...
140 lb. ...	...	59	...	58
Blood and bone, 166 lb. ...	...	...	...	60
Unmanured	50	62	33	56

* M4 consists of 5 parts superphosphate and 2 parts sulphate of ammonia; M8 of 5 parts superphosphate and 4 parts sulphate of ammonia; M11 of 2 parts superphosphate and 1 part nitrate of soda; M13 of 10 parts superphosphate and 3 parts sulphate of potash.

RAINFALL during Fallow and Growing Periods.

Place.	Fallow.	Growth.
	points.	points.
Dangarsleigh	262	1,746
Ben Lomond	458	1,622
Sunnyside	37	1,447
Red Range...	25	2,029
Carrowbrook	2,974	2,410

Red Range.—Sloping fairly steeply to the north; red free working loam overlying porous red clay of basalt origin. The experiment was the sixth crop since the land was broken from native pasture, previous crops being potatoes in 1920, maize in 1921 and 1922, potatoes (fertilised with 1 cwt. superphosphate per acre) in 1923, and maize (yielding 45 bushels per acre) in 1924. The section was not stocked after the removal of the maize cobs in the winter of 1925. The maize stalks were turned under from 1st September, 1925, ploughing to a depth of 5 inches, and harrowed twice directly after. Drills were opened out with the plough about 4 feet apart and three grains

dropped 3 feet apart, and covered by harrowing the way of sowing. At the time of sowing the moisture was not sufficient for germination, and unrotted corn stalks were present. The plant stand generally contained two plants every 3 feet with occasional misses. Judging by the sturdy growth and in view of the rainfall, a much greater yield would have resulted had the stand been satisfactory. Good quality grain was garnered of all varieties. With the exception of Whitecap, Funk's Yellow Dent and Gold Coin, all the varieties were dry enough to thresh and bag on 21st May, and those mentioned only needed about another fortnight to bring into a proper state. The local variety known as Prince's Yellow Dent showed considerable variation in type.

In the fertiliser trial on a lower section of the slope to that on which yields were computed and tabulated, the M11 plot yielded 65 bushels, and the M8 47 bushels per acre. This may be due to the greater benefit from M11 on soils excessively acid.

Carrowbrook.—Creek flat; soil deep black freeworking deposit. In 1924 oats (unfertilised) were grown and fed off while green by cows during the early summer months. Ploughed 8 inches deep late in December, 1924, the objective at the time being a sowing with lucerne the following autumn, but this was abandoned owing to the prevalence of Nut grass. The land was subsequently ploughed five times about 7 inches deep and thrice springtined to rid it of Nut grass. The last ploughing was on 1st December, 1925, and immediately afterwards the land was harrowed and rolled. The plots were sown on 3rd December, the seed being covered with a Planet Jr. cultivator. Rows 3 feet 9 inches apart, three grains dropped every 3 feet. Inter-row cultivations were given from time to time, and the crop kept free of weeds. A sturdy tall growth resulted and few misses were noticed. The low rainfall in January and February and early March affected the yield, but there is no doubt that it was the moisture conserved during the twelve months fallow that enabled the crop to withstand the two and a half dry and hot months, January to early March, and yield one of the very few grain crops in the district. The maize grew to a height of 7 feet, Fitzroy being tallest and appearing to suffer least during the growing period from the dry conditions. Although the seed of all varieties was sown on 3rd December, the dry conditions at seed depth left the seed dormant and the first appearance of plants was about Christmas time. A good stand resulted, however.

For grain production the plots at Kentucky, Redbourneberry and Mount Olive (the two latter places in the Singleton district) were virtually a failure. At Mr. J. Garland's plots at Mt. Olive there was a fair grain prospect, but the crop was more valuable as green fodder and was used for this purpose.

Stem growth on Mr. J. Moss's plots (Singleton district) attained a height of 9 feet, and it was nearly as good at Mr. J. Monkley's and Mr. J. Garland's. At Kentucky excessive rains and soakage when the crop was half grown caused the crop to fail, the experimenter expending considerable energy in cultivation in the effort to attain success.

Pasture Improvement Experience.

In the Cowra District.

J. N. WHITTET, H.D.A., Agrostologist.

In many parts of the Cowra district the work of pasture improvement is receiving considerable attention at the hands of farmers and pastoralists, the chief aim being the introduction of plants having a greater duration of growth than the ordinary "herbage." The latter consists mainly of Barley grass (*Hordeum murinum*), Burr clover (*Medicago denticulata*), Ball clover (*Trifolium glomeratum*), Crowfoot (*Erodium cygnorum, E. cicutarium, E. moschatum*), and Mallow (*Malva parviflora*) With the advent of warm weather the herbage dies off, and detrimental Spear grasses (*Stipa spp.*) are present in large quantities in many pastures. In order to lessen the danger of grass seed infestation and provide clean paddocks for ewes and lambs, grasses, clovers, and lucerne are being sown in order that grazing may be obtained which will be free from these deleterious "seedy" grasses.

The perennial winter grasses which have given best results at Cowra Experiment Farm are Toowoomba Canary (*Phalaris bulbosa*), Hooker's Fescue (*Schedonorus Hookerianus*), Tall Fescue (*Festuca elatior*), and Giant Fescue (*Festuca arundinacea*); the most promising drought-resistant summer grass is Giant Panic (*Panicum antidotale*).

The Experiment Farm has demonstrated for many years past that lucerne sown on average wheat country is one of the most valuable grazing propositions for the district. On this class of land lucerne will carry an average of four sheep per acre for five years, after which time the crop thins out until it is little better than unimproved pasture, the carrying capacity of the latter being slightly over one sheep per acre. Autumn sowing of lucerne is recommended, using 6 lb. of seed per acre.

Subterranean clover is giving good results on country that is too shallow or too rough for lucerne, especially if top-dressed with superphosphate at the rate of 1 cwt. per acre per annum; the fertiliser should be applied about July. Although lucerne provides good grazing during most months of the year, it does not make vigorous growth during June and July, the time when Subterranean clover produces satisfactory results. The fact that Subterranean clover is making headway during the cold weather constitutes it a valuable addition to the "King of Fodders."

Wimmera Rye grass (*Lolium rigidum* var. *strictum*) is coming into favour, especially with pastoralists. It is a free-seeding annual, with a period of growth from March to November, and it is particularly valuable for the poorer classes of country, as well as being useful for sowing with lucerne or Subterranean clover on worn-out cultivation paddocks.

A Grazier's Results.

Mr. J. C. Blackmore, "Lansdown," Wattamondara, planted in May, 1925, on fallowed land, 10 acres of Wimmera Rye grass, 10 acres Tall Oat (*Avena elatior*), 1 acre Hooker's Fescue, 30 acres *Phalaris bulbosa*, and 5 acres Subterranean clover. The areas were not stocked until the grasses set seed. Wimmera Rye grew to a height of 4 feet in places, the average being about 2 feet 6 inches, while *Phalaris bulbosa* in parts attained a height of 5 feet. Both grasses seeded well. Subterranean clover was satisfactory

A Native Grass Seed Reserve at Cowra Experiment Farm.

right through the season; it covered the ground well, and formed plenty of seed in November.

All these grasses and the clover were sown at the rate of 4 lb. per acre, with 60 lb. superphosphate per acre. In June, 1926, Mr. Blackmore reported as follows:—

"Heavy rain was experienced after sowing and the ground caked badly. Dry conditions ensued after November, but in spite of this fact the area carried and fattened about six sheep per acre from 26th December, 1925,

until the end of March, 1926. We then had good rains and I took the sheep off, though there still remained a large bulk of feed.

"The sheep seem to prefer the *Phalaris* and the Subterranean clover, though they also like the Rye grass. Since March we have had a lot of rain, and the grasses, with the exception of Tall Oat, have come away splendidly. On 19th May I put lambs on the area; have already sent away two trucks and still have 300 lambs, most of them prime, grazing on the paddock. There is more feed there than they can manage. The paddock was top-dressed with 60 lb. superphosphate per acre last April.

"The countr is ordinary wheat land. In March and April of this year I sowed 45 acres of fallowed, sandy loam with 4 lb. of Subterranean clover seed per acre, and 35 acres of newly worked ground with 2 lb. of clover per acre; every seed seems to have germinated. Superphosphate at the rate of 40 lb. per acre was sown with the seed.

Rows of Lucerne Selections at Cowra Experiment Farm.

"I have also 250 acres under lucerne, partly creek flats and partly higher ground. That on the creek does splendidly, and a lot of hay was made, several pits of silage filled, and 2 tons of seed obtained from the area during the past season. The lucerne on the higher ground is grazed, and it carries on an average three sheep per acre; I believe on the shallow, poorer class of land Subterranean clover is more suitable."

Top-dressing Pastures.

Our trials carried out in this district show that 84 lb. superphosphate per acre applied every second year considerably increases the growth and seed production of all the clovers. The "herbage" remains greener for a

longer period on the top-dressed areas than on unmanured ones, and stock show a decided preference for the grazing where the superphosphate has been applied.

In a good year the pastures contain in addition to Spear grass and "herbage" a fair proportion of useful grasses, such as Wallaby grass (*Danthonia semiannularis*), Star or Windmill grasses (*Chloris* spp.). Panic grasses (*Panicum* spp.), which also respond to superphosphate.

Suitable Mixtures to Plant.

The following mixtures are recommended for this district:—

(*a*) For average wheat country—

Phalaris bulbosa	2 lb.	seed per acre.
Wimmera Rye	4 lb.	
Lucerne	3 lb.	

Giant Panic Grass at Cowra Experiment Farm.

(*b*) For poorer types of soil—

Wimmera Rye	3 lb.	seed per acre.
Tall, Giant, or Hooker's Fescue	2 lb.	
Sheep's Burnet	2 lb.	
Subterranean clover ...	2 lb.	

In the case of the above two mixtures, the seed can be sown with the wheat drill, care being necessary, however, to ensure that the seed is covered, but not buried more than ½-inch deep. To obtain an even distribution of

the seed, mix it with superphosphate (½ to 1 cwt. per acre), and sow through the fertiliser box of the drill.

(*c*) For broadcasting in the rougher types of country—

Wimmera Rye	4 lb.	seed per acre.
Sheep's Burnet	2 lb.	
Subterranean clover ...	2 lb.	

The seed should be distributed by hand, or per medium of a top-dressing machine.

All the mixtures given above should be sown during March or April.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th June, 1926.

Description.	Imports.	Exports.	Description.	Country of Origin.	Imports.	Exports.
Interstate.			*Oversea.*			
	Cases.	Cases.	Fresh Fruits—		Cental.	Cental.
Fresh Fruits ...	802,751	95,647	Citrus ...	....	1,368	3,540
Tomatoes ...	25,157	...	Apples	....	26	3,866
		Bus.	Pears ..	....	...	1,002
Melons ...	......	1,034	Pineapples ...	....	...	783
	lb.	lb.	Bananas ...	....	1,979	...
Canned Fruits ..	35,700	224	Other ...	....	...	2,654
Dried Fruits—			Dried Fruits—		lb.	lb.
Unspecified ...	2,240	...	Apples ...	....	...	2,214
Currants ..	6,944	392	Apricots ...	....	...	482
Raisins ..	5,264	280	Currants ..	....	...	4,390
Apricots ..	784	...	Prunes ...	U.S.A. ...	32,189	978
Apples ...	2,744	280	" ..	France	392	...
Prunes ...	672	...	Peaches ...	....	...	65
Pears ...	336	...	Raisins—			
Sultanas ...	364	...	Sultanas ...	....	...	769
Peaches ..	784	...	Lexias ...	....	...	28
			Other ...	....	...	2,712
			Dates	Algeria	745	93,104
				Iraq	17,070	...
				Mesopotamia ...	14,729	...
			Other	....	...	1,237
				Asia Minor ...	2,232	...
				China	3,726	...
				Syria	90	...
				Turkey	5,579	...
				United Kingdom	412	...
				United States ..	3,460	...
			Preserved in liquid—			
			Apricots ...	....	...	117,309
			Peaches ...	....	...	677,652
			Pears ..	....	...	3,687
			Pineapples ...	....	...	9,160
			Raspberry ...	....	...	1,296
			Other ...	....	...	30,473

The Diet of Sheep in Western New South Wales.

AND ITS RELATION TO SICKNESS OF DIETETIC ORIGIN.

H. G. BELSCHNER, B.V.Sc., H.D.A., District Veterinary Officer (West).*

RECENTLY numerous mortalities among sheep have been reported in this State, which investigation has shown to be due to dietetic causes. It is interesting to note also that as far as the western part of the State is concerned, the mortalities occurred on holdings several hundred miles apart, at about the same time. The season was a good one—the best the west has experienced for some time.

In enumerating the principal grasses, herbage plants and scrub trees which form the chief diet of sheep in western New South Wales, one must generalise a good deal, as the west represents a large area of country, with considerable variation in class. Most of the grasses, herbages and edible scrubs of the west are indigenous. Very little has been done in the way of laying down pastures on cultivated land. A few introduced grasses have been tried and have done well for a time, but drought and overstocking have been responsible for their disappearance, as they have also for the serious depletion of many of the native grasses and shrubs from parts of the country. Most of the edible shrubs and a lot of grasses also, being surface feeders, are shallow rooted, and as a result of constant stocking the surface soil becomes blown away and the young shrubs and grasses are easily pulled out when the sheep are feeding. In a good season a good deal of the western country produces a wonderful growth of herbage which is very fattening for sheep and is particularly valuable at lambing time, but this herbage does not last long and after October it soon dies. In the trefoil country, however, the burrs remain, and in a drought time the latter will keep sheep alive for a long time.

The principal grasses indigenous to the west are as follows:—

(1) Spear grass or Corkscrew grasses (*Stipa* spp.). Among the most drought resistant of the native grasses, and a great standby in the west. They are grasses that respond very quickly to rain and are among the first to make their appearance after the winter season. It is the above facts rather than the feeding value which renders them particularly valuable. Reference will be made later to the seeds of these grasses which bore their way into the flesh of sheep, causing mechanical injury and also assisting the entry of micro-organisms.

(2) Wallaby grass (*Danthonia* spp.), various species. Important grasses due to the fact that they maintain growth right throughout the year. Very palatable and grow frequently in association with Corkscrew grass, forming

* Paper entitled "Observations on the Diet of Sheep in Western New South Wales," read at the Australian Veterinary Association Conference, Sydney, March, 1926.

with the Stipas the greatest part of the native pastures of the tablelands and slopes of the interior. Danthonias are fine-leafed tussocky grasses with well developed tufts of hair on the flowers. Exceptionally good drought resisters.

(3) Flinders grass (*Iseilema Mitchelli*). A palatable and nutritious grass never very abundant in the west, relished by sheep even when dry.

(4) Mitchell grasses (*Astrebla* spp.). The great grasses of the Darling Downs (Queensland). Chiefly confined to central slopes and plains. Valuable grasses. Curly and Bull Mitchell are said to be the most palatable. Require good summer rains and mild winter for their development. Are rapid growers.

(5) Kangaroo grass (*Anthistiria* sp.). A valuable western grass but only seen now on lightly stocked areas. Rather a coarse grass for sheep but provides good fattening fodder.

(6) Eragrostis grasses (*Eragrostis* spp.). In the west often known as Never-fail. Drought resistant hardy grasses, useful in a dry spell.

(7) Queensland Blue grass (*Andropogon sericeus*). A good sheep grass rapidly disappearing from the west, due to overstocking. Good summer grass but not as good a drought resister as others.

(8) Star or Windmill grasses (*Chloris acicularis* and *C. truncata*). Nutritious grasses relished very much by sheep.

Other grasses available for sheep in these areas are:—Brown Top or Sugar grass (*Erianthus fulvus*), found on the black soils chiefly; Coolah (*Panicum prolutum*); Native Panic grasses (*Panicum* spp.); Native Oat (*Themeda avenacea*); Satin Top (*Andropogon erianthoides*); and the following introduced grasses:—Barley grass (*Hordeum murinum*) useful when young; Rats Tail Fescue (*Festuca bromoides*); Brome grass (*Bromus maximus, B. mollis,* and *B. Sterilis*); Stink grass (*Eragrostis major*); Canary grass (*Phalaris bulbosa*), the only grass that has held its own on the lower Macquarie River, and Couch grass (*Cynodon dactylon* and *C. incompletus*), found along the watercourses.

Herbage.

A great portion of the west of New South Wales is herbage country. In a good season the herbage is very prolific and of great variety. Sheep fatten more quickly on herbage than on any other class of feed; in fact they frequently become too fat and the health of the animal is probably interfered with. Following are some of the chief herbage plants:—

Trefoils (*Medicago* spp.). Of these *denticulata* (burr trefoil) is the most abundant. The burrs are detrimental to the wool but are a great standby in time of drought. Others are *minima* (woolly trefoil) (which has hairs on the stems and leaves, and is not so abundant—it is found on central slopes and tablelands and does not last long) and *M. masculata* (spotted trefoil).

Clovers (*Trifolium* spp.); Crowfoot (*Erodium* spp.), various varieties, native and introduced; Lamb's Tongue (*Chenopodium atriplicinum*); Plantain or Wild Sago (*Plantago varia*), also called Lamb's Tongue; Pig Weed (*Portulaca oleracea*), succulent leaves and stems; Wild Carrot (*Lepidium fasciculatum*), a cruciferæ; Pepper weed (*Lepidium hysopifolium*), a cruciferæ; Shepherd's Purse (*Capsella bursa-pastoris*); Flat weed or False Dandelion (*Hypochæris radicata*); Spurry (*Spergula arvensis*); Wire weed, hog weed or knot weed (*Polygonum aviculare*); Sow thistle (*Sonchus oleraceus*); Native Daisy (*Helipterum floribundum*); Marsh Mallow (*Malva parviflora*); Wild Melon (*Cucumis myriocarpus*); Sheep sorrel (*Rumex acetosella*); Rough-headed Poppy (*Papaver hybridum*); Yellow Pea Bush (*Cassia sophora*); Darling Pea (*Swainsona Greyana*); Caltrops (*Tribulus terrestris*); and many others.

Saltbushes.

In the far west several varieties of saltbushes provide useful feed for sheep and are of particular value in drought time. Unfortunately much valuable saltbush has completely disappeared from many parts of the west, due to overstocking of the country. Some of the chief varieties are:—Old Man saltbush (*Atriplex nummularia*), Bladder saltbush (*Atriplex vesicarium*), Creeping saltbush (*Atriplex leptocarpa*), one of the best, and (*Atriplex halimoides*). Atriplex forms the most important family and is the black soil country saltbush. The family Rhagodia contains the hastate-leaved saltbushes, *Rhagodia hastata* and *Rhagodia linifolia*, which have succulent fruits. Growing on the lighter red soils and sandy soil are found varieties of *Chenopodium.*

Severe droughts and overstocking have depleted the saltbushes and on many holdings they have been totally destroyed, hence they do not form such a large part of the diet of western sheep as formerly.

Edible Scrub and Fodder Trees.

The western districts of New South Wales are subject to prolonged periods of dry weather, but when all other feed has disappeared there is always the edible scrub and fodder trees to fall back upon as feed for sheep. The drought resistance of these trees is remarkable. Many thousands of sheep subsist solely on this class of feed for a considerable period during a drought. Again, injudicious management, such as felling the trees instead of lopping them, and overstocking, thus preventing the growth of seedlings, has resulted in many varieties of fodder trees becoming well-nigh extinct over tracts of country upon which they were at one time plentiful. Some of the more common edible trees and scrubs that are lopped during a drought as feed for sheep in the west are the following:—Kurrajong, wilga, rosewood, leopard tree, box and gum, eucalyptus, currant bush or warrior bush, currawang, beefwood, emubush, mulga, yarran, supple-jack, colane or celane, gigea, belar, apple tree, white wood, willow and myall. Some of these trees, like mulga, can be reached by sheep and are kept trimmed to a height of a few feet from the ground.

Providing that there is a plentiful supply of good water, sheep will keep in fair store condition during the warm months on any of the mentioned fodder trees or shrubs. Laxative licks (such as one part Epsom salts, 3 parts Liverpool salt, four parts molasses) are usually supplied, and are of great assistance in keeping the bowels open. It has been noticed that the shorter the distance that sheep have to walk to water when feeding on scrub, the longer will they hold their condition. When the cold weather sets in it is more difficult to keep sheep alive on scrub alone.

It is interesting to note that sometimes sheep will not eat some of the well known fodder trees when they have been lopped. I have noticed this particularly with wilga. Old drovers say that if the tree is burnt down the sheep will eat it. This is, of course, a bad practice, as the tree is spoilt. This also applies to some of the box and eucalyptus trees. It is a common practice before lopping to chew up a few leaves, and if they are palatable the tree is lopped for the sheep.

The rainfall of course has a great influence on the type of flora upon which sheep feed in the west. It is the low and irregular rainfall that is responsible for the absence of introduced grasses and the reason why only the hardy native plants survive.

Sickness and Mortality of Dietetic Origin.

Apart from cases of mortality due to impaction of the digestive organs in time of drought, pre-parturient paralysis of ewes, hoven, &c., and such troubles as trefoil dermatitis, staggers, &c., we frequently meet with dietetic troubles in the west, which, beyond a certain point, are somewhat puzzling. In the light of further knowledge, however, some of the troubles which at present we believe to be of dietetic origin may prove to be due to other causes.

1. *Acute Renal congestion (Pulpy Kidney) in Plethoric lambs.*—Mortalities occur in the central west of New South Wales from time to time, usually during good seasons, among the best and fattest lambs at ages ranging from three to eight weeks. Apart from acute congestion of the liver and kidneys, especially the latter, which are usually quite pulpy, very little is seen at post-mortem examination. The trouble is said to be brought about by over-nutrition and lack of sufficient exercise.

During an investigation in the spring of 1924, a botanical survey was made by a botanist of the paddocks on several holdings where lambs were dying. In two paddocks on one holding thirty species of plants were identified, forming a close mat of vegetation, representing thirteen families and twenty-six genera. In all the sixteen paddocks visited except two, species of "medics" (*Medicago denticulata* and *M. minima*) were found in fair abundance, and in each of the paddocks where the largest number of lambs died there was a greater abundance of medic, particularly *M. denticulata*. Whether any harmful effect can be attributed to this plant if eaten in its early stage, or whether it is in any way connected with the trouble

except in so far that it is a very nutritious plant, can only be determined by experimental feeding tests. The great variety of herbage plants was very noticeable in all the paddocks. The list submitted by the Botanist showed no plants that could be regarded as poisonous. Gilruth has drawn attention to this condition in lambs in New Zealand, and states that it is due to overnutrition when the ewes are on good feed and are yielding a plentiful supply of rich milk. Docking the tail is recommended when lambs commence to die, and this has been found effective in this State. The bleeding appears to relieve the plethoric condition and enables the system to regain its normal balance. Exercise by removing the ewe and lamb to a poorer pasture is also recommended as a measure to counteract the mortality.

2. *Mortality among grown sheep in the west during a good season and when there has been abundance of feed, particularly herbage.*—A number of cases of mortality were reported from different parts of the west last year, all within a fortnight and during the spring of the year. Careful investigations were carried out and numerous specimens forwarded to the Veterinary Research Station for examination. There was a marked similarity about all these cases, and it was noted that they occurred at about the same time on similar country, growing similar herbage, which was plentiful and of great variety. One big station lost over five hundred sheep. Post-mortem examinations revealed as an outstanding feature congestion of the small bowel, otherwise there was little abnormality. From all the specimens, blood smears, &c., forwarded to Glenfield, no micro-organisms were detected.

In the writer's opinion these mortalities were of dietetic origin due to some toxic plant or plants not definitely known, and the evidence seems to point to the plants being at a certain stage of growth.

Most of the paddocks where sheep had died were gone over carefully and plants collected and forwarded to the Botanist for identification. Also contents of sheep's stomachs were forwarded for identification, after drying, of the plants present. So far the only plant that has fallen under definite suspicion is *Chenopodium atriplicinum*, a member of the saltbush family, commonly known as Lamb's Tongue. The plant has succulent leaves and stems and is relished by sheep. It was at the seeding stage when the cases of mortality occurred. This plant was found on all the holdings visited and growing profusely. The sheep's stomachs forwarded from two holdings 100 miles apart contained the seeds rather abundantly. The Botanist's remarks in regard to *Chenopodium atriplicinum* are: "This plant has frequently been suspected of poisoning cattle and sheep; the evidence certainly points to it being a dangerous plant."

Another plant slightly under suspicion in connection with these mortalities is *Plantago varia*, commonly known as Wild Sago and also sometimes called Lamb's Tongue, a rather small plant, which seeds profusely. It has a reputation of being a good sheep feed in the west. This plant was also found in quantity on the holdings. Feeding tests alone will prove whether the above plants are toxic at a certain stage of their growth.

In regard to the poisonous properties of plants D. A. Herbert, M.Sc., in a bulletin on the Poison Plants of Western Australia, states:—"The poisonous properties of the native plants vary considerably in different parts of the plant and with the time of the year. As a general rule the most dangerous period is during the time when the plant is flowering and seeding. Poisonous properties are a protective device and Nature's object being the perpetuation of the species and not the individual it is to be expected that the reproductive parts will be better protected than the vegetative. A number of plants, though probably containing small quantities of poison throughout the year, only become dangerous at flowering period."

We know that with plants containing prussic acid the amount varies at different stages of the plant's growth and the period of the year. It is well known that Blue Couch (*Cynodon incompletus*), found along watercourses in the west and eaten by sheep, is not poisonous in all stages of its growth.

Rosewood (*Heterodendron oleæfolium*) collected near Nyngan has been found by chemical examination to contain more hydrocyanic (prussic) acid during certain months of the year. Latest examinations conducted during 1922 showed the amount of HCN to be at its maximum in March, April and May and that it then commenced to fall again, The same thing applies to Fuchsia bush (*Eremophila maculata*). In the case of rosewood there was a difference also in the new and old growth (more in the former). Weather conditions also have some effect on this.

Another factor, and an important one, is how hungry sheep are when brought on to a change of feed, especially if it be a poisonous grass patch, or on to feed such as rosewood. This condition has not entered into the abovementioned mortalities, however.

Hydrocyanic acid has been detected in a number of grasses, herbages and fodder trees, and it is likely that it will be found in certain grasses and herbages in the west not yet suspected.

3. "*Yellows" in Sheep.*—A kind of toxæmic jaundice has occurred in sheep in the west on different occasions. An outbreak occurred in the central west recently among some young sheep (six months old). The symptoms are œdema of the face and ears, above and below the eyes, considerable lacrimation and congestion of the mucous membranes of the eyelids with some yellowness, with eyelids glued together in some cases; encrustations about the nostrils and face, with hard dry scabs on upper surface of the ears; skin dull yellowish colour. Post-mortem: Acute congestion of intestines, icteric condition of liver and kidneys. Microscopical examination has so far not revealed any organisms, and the condition does not appear to be bacterial according to Dr. Seddon's findings. The condition therefore appears to be due to some plant toxin, but the plant responsible has not yet been proved.

The plants suspected are—*Dichopogon sieberianus, Bulbine bulbosa,* and *Tribulus terrestris.* None of these plants, however, was found in the paddock where the above mortality occurred. The principal plants there

were—Black Thistle (*Carduus lanceolatus*) in great quantity, St. Barnaby's Thistle (*Centaurea melitensis*), *Tunica prolifera,* Couch grass (*Cynodon dactylon*), a few other grasses and some small creeping plants. The paddock was an old cultivation. The number of sheep affected was 5 per cent. Of these 2 per cent. died and the balance recovered.

The Effects of Grass Seeds.

Lastly, grass seeds, particularly *Stipa* spp. are responsible for considerable mortality among sheep grazing over that particular class of country. All are familiar with the manner in which grass seeds work right through the skin into the submucosa and musculature, also with the trouble caused by the seeds gaining access to the eyes in young lambs particularly.

The question is often asked as to how far the grass seeds assist the entrance of the anthrax spore into the blood stream. It has been noticed that outbreaks of anthrax in parts of the west correspond with the seeding of the grasses. This has been so pronounced for the last two years that the question of temporarily closing about thirty miles of stock route in an anthrax area for several months during the grass seeding season (October to December) is being considered. Other organisms may also gain entrance to the animal's bodies through the agency of grass seeds—for example the tetanus spore and the bacillus of Preisz Nocard (the cause of caseous lymphadenitis in sheep).

In conclusion, it must be added that the continual grazing of sheep over certain country for say fifty years must be depleting the soil of certain mineral ingredients, particularly calcium phosphates, especially where overstocking is practised, as it commonly is in the west. The question of the fertilisation of pastures in the west by applying artificial manures will apparently have to be faced sooner or later, although it is a big question considering the size of the holdings.

I have in mind an example of two holdings in the west. On one property is still to be found a good deal of valuable saltbush, and after a dry spell when twenty points of rain fall, a good shoot of feed always results. On the other property with only a fence between, where overstocking has been practised, there is no saltbush and a good fall of rain is needed to bring the feed along.

INFECTIOUS DISEASES REPORTED IN JULY.

THE following outbreaks of the more important infectious diseases were reported during the month of July, 1926:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	27
Piroplasmosis (tick fever)	Nil.
Swine fever	Nil.
Blackleg	5

—MAX HENRY, Chief Veterinary Surgeon.

Weeds of New South Wales.

Birch's Bassia (*Bassia Birchii* F.v.M.).

R. H. ANDERSON, B.Sc. (Agr.), Assistant Botanist.

This plant has been forwarded for identification with increasing frequence during the past two years by shire officers and farmers who regard it as an objectionable weed and one which appears to be spreading.

Description.—It is a native plant of spreading habit, 2 to 3 feet high, and very intricately branched. The leaves are small and narrow, about ½ inch long, and clothed, as are the stems, in white cottony tomentum.

The inconspicuous flowers are very numerous, occurring in practically every leaf axil, and later develop into a hard spiny, burr-like fruit. These fruiting perianths or "burrs" are provided with five fairly stout spines, the longest about ⅓ inch long, giving the plant a rather formidable appearance. At times the whole of the plant, or portion of it, becomes broken off from the ground and is carried along by the wind, often forming quite considerable ball-like masses. In this respect it resembles a closely allied species, *Bassia quinquecuspis* ("roley-poley"), the latter species being even more brittle and prone to form balls.

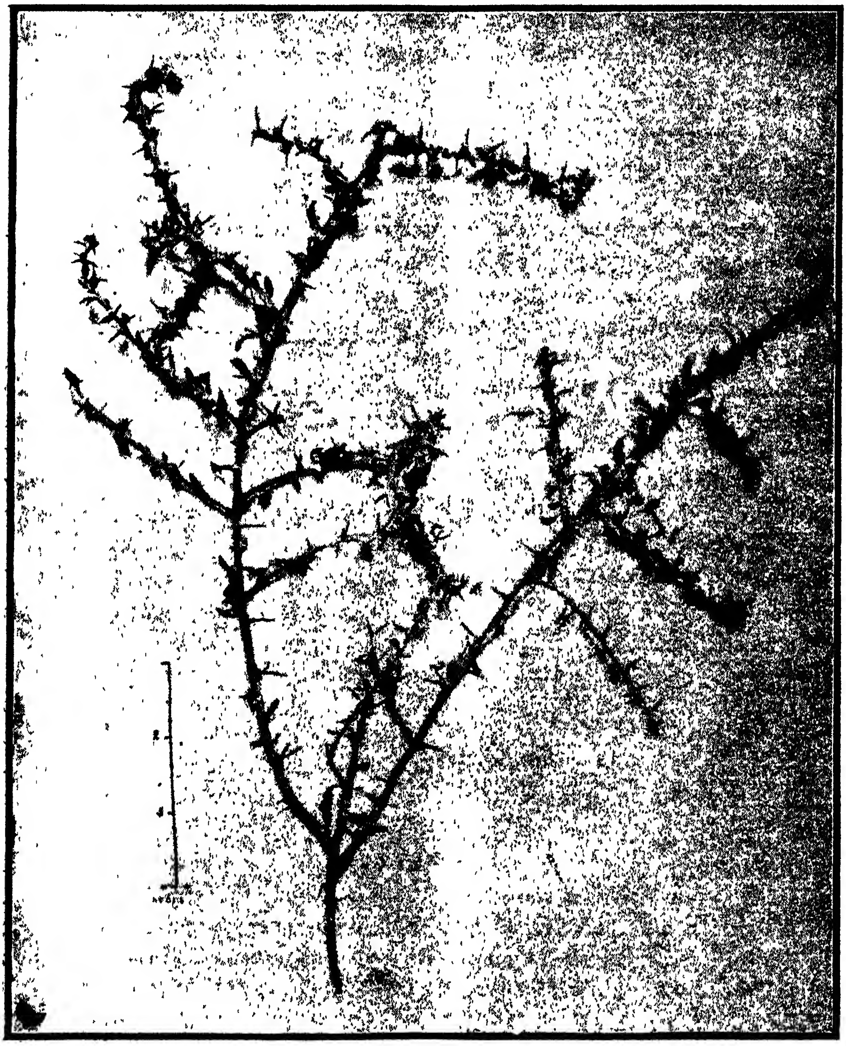
Vernacular Names.—There does not appear to be any widely adopted common name for this plant. It has been sent in for identification as "Galvanised burr" and "Woolerino burr." The latter name is apparently quite a local one. It is also sometimes referred to as "roley poley," but this name is more usually applied to a number of other plants to which it more aptly belongs. As the name Bassia is a very simple one and not difficult to remember, it would seem best to encourage its use as a common name, and it is therefore suggested that the name Birch's Bassia be applied to this plant.

Distribution.—It is fairly widely distributed in western Queensland and western New South Wales, and appears to be spreading. Narromine, Walgett, and Gunnedah are the districts from which we most commonly receive it. The Shire Clerk at Gilgandra reports that "it threatens to become a pest and is spreading rapidly along roads."

Properties.—Owing to stock not touching it and its drought-resistant qualities, it spreads over considerable areas in the drier parts of the State. Its spiny character and unsuitability for stock food make it quite useless, and it should therefore be regarded as a noxious weed. The burrs adhere to the hair and wool of stock, and are disseminated over a wide area.

A Closely Allied Plant.—As mentioned above, this plant is closely allied to another Bassia, *B. quinquecuspis*. This is best described as being a much weaker and less formidable form of Birch's Bassia, but the general characters

of the two are much the same. *B. quinquecuspis* is widely distributed in the State and is frequently sent in as a noxious weed. It has been proclaimed noxious in the municipalities of Camden and Forbes.



Birch's Bassia (*Bassia Birchii*).

The safest method for any farmer to adopt is the banking of all moneys received, and the payment of accounts by cheque as far as possible. His pass-book then becomes a very valuable aid in book-keeping. Small accounts may be paid from petty cash, a cheque for £5 or £10 being drawn for this purpose as required.

Intensive Pasturing Methods in Victoria.

W. H. BROWN, Editor of Publications.

THE applications of the word "intensive" multiply rapidly. In almost every sphere it is to be heard, and in none more frequently than in relation to agriculture. As applied to the depasturing of live-stock it is perhaps less common, but there is nothing hazardous about suggesting that it is bound to acquire a positive significance in the near future.

Already the thought of pasture improvement is familiar. The propaganda work of Mr. J. N. Whittet, Agrostologist of the Department of Agriculture, and the success that is attending the trials of graziers in many parts of the State are popularising the idea in New South Wales, and an intensive use of pastures is developing in consequence. In Victoria also there is a marked movement in the same direction, and while some of the methods adopted there may not be wholly applicable in this State, a good many of them are decidedly suggestive. Information gathered in recent conversations with certain officers of the Victorian Department of Agriculture, and with a number of farmers and graziers in that State is therefore likely to be of interest.

Our purpose will be best served by an account of the results obtained from a high-quality irrigated grass and clover pasture at the State Research Farm at Werribee, and by a description of the methods by which irrigated lucerne is grazed in the Goulburn Valley.

Werribee Research Farm and its Influence.

A great variety of experiment, research, and demonstration work is proceeding at the Research Farm. In area this farm exceeds 2,200 acres, and comprises both dry farming and irrigation land, the soils varying from comparatively good to very poor. By reason of the similarity of the soils to those occurring on a considerable area in the surrounding district, and also to certain soils in more distant parts of the State, the work done is of wide importance to Victorian farmers. Much of the soil on the farm, for example, in addition to resembling various closer settlements in the vicinity, is very similar in physical character and chemical analysis to a good deal of irrigable land in the Goulburn Valley, though in the latter district the subsoil is probably better.

The irrigable land at Werribee consists of an alluvial soil underlaid by a grey-blue pug subsoil, and the results obtained on it have had a marked influence on land values around. When in 1912 the Closer Settlement Board acquired several thousands of acres at Werribee at £22 per acre, with a view to subdivision and settlement as irrigation farms, the older settlers were

sceptical, but the fourteen years have justified the policy, and to-day that land is worth round about £60 per acre—an advance that cannot, we were assured, be attributed to the improvements added, but to the proof afforded by the Farm and by the settlers themselves of the productiveness of the soil under irrigation. Influenced by the earlier results, further land was acquired after the war and made available to returned soldiers, who also have done quite well. In one case a soldier-settler, who had paid £25 per acre for his land, recently sold at £58, the result of a better understanding of the possibilities of the country.

On the dry country that forms part of Werribee Research Farm, experiments are being conducted for the improvement of wheat and other cereals, grasses, &c., the renovation of soils, the maintenance of fertility by rotations, the breeding and feeding of live-stock, and so forth. These results also have been of marked importance, and might well occupy attention, but it is the 200 acres under irrigated lucerne and the similar area under irrigated sown grasses that to us are of more immediate interest.

Pasture Problems at Werribee.

The value of lucerne as a grazing crop is thoroughly appreciated in Victoria, and in some districts considerable areas are utilised in that way. Indeed, in the Goulburn Valley a system of live-stock farming is growing up, of which the grazing of lucerne may be said to be the essence. At Werribee, with carefully-graded land, divided by check banks into bays from 5 to 20 chains long and two-thirds to 1 chain wide, and flood-irrigated half a dozen times in the summer, first-class irrigation land has a carrying capacity of ten sheep per acre throughout the year, and second-class land six sheep per acre. By this it should be understood, of course, that in the winter the capacity is much lower than in the summer, but in the total the capacity of the best land is 3,650 "sheep-days" per acre per annum.

As a grazing proposition, however, lucerne alone has been found here to have certain definite limitations. The ration it affords is rather narrow and may create abnormal conditions as to health and development. Nor does it like hard grazing, for, whereas under cropping for hay, a stand will last for ten or twelve years, and even longer, injudicious grazing may kill it out in four or five years.

An Irrigated Grass and Clover Pasture.

Hence attention has latterly been directed on the Research Farm to the discovery of a mixed pasture, suitable for irrigation, which will give a better balanced ration, stand rougher treatment under grazing, and supply feed all the year round. Various trials have been conducted to this end, and a mixture has been arrived at which seems to meet requirements in a remarkable way. By combining several grasses and clovers, an abundant and highly nutritious growth has been obtained, from which the animals can always select a balanced ration, as one plant comes forward after

another in response to seasonal conditions. A small enclosed area of this pasture was cut each month last year, and yielded greenstuff at the rate of 21 tons per acre for the twelve months. The mixture consists of—

12 lb. English rye grass.
4 lb. Cocksfoot.
4 lb. Prairie grass.
2 lb. Lucerne.
1 lb. Red clover (cow grass).
1 lb. White Dutch.
1 lb. Alsike.
1 lb. Strawberry clover.
1 lb. Subterranean clover.

The land on which this mixture is sown varies from first to second class, and even third-class, irrigation land. Previously it carried approximately one sheep per acre all the year round, but to-day, under sown pasture which is irrigated, say, half a dozen times in the hotter part of the year, the poorest of it carries up to five sheep per acre, while the best is yielding great quantities of feed, and producing excellent results under both sheep and cattle. The carrying capacity is quite equal to that of the lucerne areas mentioned, but it has the additional recommendation that it has not the limitations of lucerne—standing harder grazing, giving heavy yields of mixed feed all the year, and occasioning none of the troubles that are apt to attend the grazing of lucerne alone. One area of 25 acres, divided into two paddocks so that they can be grazed alternately, carried fifty-two cows on the average throughout the year, the grazing being supplemented at the bails with a more concentrated ration (varied in quantity according to the individual milk yields of the cows) of about 6 lb. bran, 6 lb. chaff or lucerne hay, and 6 lb. silage.

Each paddock is graded for irrigation and divided by check banks into bays, on to each of which the water is turned about every four weeks throughout the summer. The water is applied by flooding, of course, and the practice is to shut off the water at the head ditch as the advanced waters at the lower end of each bay nearly reaches the drain. Victoria is a land of winter rainfall, and of light summer falls, and half a dozen applications of water of 3 or 4 inches each are essential to the heavy yields of feed obtained.

And Superphosphate, of course.

Top-dressing with superphosphate is essential here as on the lucerne areas. In fact, it is most interesting to find the extent to which superphosphate is used on pastures in Victoria. Graziers using both native and sown pastures will tell you they apply it regularly at 1 cwt. per acre per annum, and will add that "not only is the effect on the clovers and grasses wonderful, but there is a marked improvement in the constitution and development of the sheep."

At Werribee they have obtained experimental confirmation of the increase in yield of feed. A plot of natural pasture, top-dressed with 2 cwt.

superphosphate per acre, showed a grazing capacity 27 per cent. greater than an untreated plot. On sown pastures the results have been just as good, 2 cwt. of superphosphate per acre being applied every year. The treatment is even more profitable on good land than on poor.

The artificial pasture described necessarily requires a certain amount of management, but as to the economy of grazing as a method of harvesting the fodder we were informed that it only cost 3s. per ton when fed off by the cows, whereas if harvested, cured, and fed out as hay, it would have cost at the least £1 per ton.

It will interest many farmers in the central-west of New South Wales to know that the manager of Werribee Research Farm is the Mr. H. C. Wilson who, in pre-war days, was Inspector of Agriculture in that district. His interest in this State remains, and in conversation he recalled advocating away back in 1912 the extension of the area under lucerne in the Coolah district. A steady increase in interest in lucerne has been a feature of the last few years in this State, but no one will question that with the fair summer rainfall that favours many of our western districts, it is possible to grow lucerne on non-irrigated areas on a much greater scale than at present, while even on river frontages there are still thousands of acres to be more effectively utilised.

The marked success that has attached to the Werribee pastures we have described should surely serve to direct greater attention to the recommendations of the Department in New South Wales for improved pasture mixtures.

Cross-breeding for Fat Lambs.

Much valuable work in the testing of various breeds for the fat-lamb business has also been done at this station, and the favour in which the Suffolk Down is held for that purpose in Victoria is, no doubt, largely due to the results obtained there. Suffolk, Southdown, Shropshire, English Leicester, Border Leicester, Lincoln, Romney Marsh, and Dorset Horn rams have all been tested on Lincoln x Merino half-bred ewes in carefully-planned experiments extending over five years. In the first year Suffolks were not included in the trials, and Border Leicesters and Lincolns brought the top prices at the Newmarket saleyards. In each of the following years Suffolk rams were included and each year their lambs headed the market, being followed by the Border Leicesters, Shropshires, Lincolns, &c., in order. The Dorset Horn was disliked by Melbourne butchers at first, but they subsequently found that the lambs of this cross dressed much better weights than most of the others, though in this respect the Suffolk, Border Leicester, and Lincoln cross lambs were above them in that order. The experiments were discontinued after the five years, it being regarded as proved that, though perhaps not quite so early as the Dorset Horn, the Suffolk was most profitable as producing a big, early-maturing lamb, which was liked by the butchers for its large proportion of lean to fat, its small loss of offal, and its good dressed weight.

At Werribee the lambs are dropped early in May and marketed about the latter part of August or early in September. Experiments have been conducted with a view to getting lambs that would take more advantage of the flush of feed in the latter part of the spring, and rams are now being joined for an August drop, which it is hoped will be fit for market late in November or early in December. In some parts lambs are dropped in October-November, and get the height of the summer flush of feed on irrigated country, but these lambs have to be very carefully handled, especially at marking time and for some days after, owing to the danger of blow-fly attacks. Obviously "grass seeds" are not "on the map" under the conditions outlined.

Lucerne Grazing in the Goulburn Valley.

From such useful work on the Research Farm, one turned with lively interest to the Goulburn Valley, where another character of things is being worked out on irrigated country. There most intensive use is being made of lucerne in connection with dairying and fat-lamb raising. By the courtesy of the officers of the Victorian Department of Agriculture, and of the generous interest of Mr. E. P. Kendall and other officers of the Water Supply Commission at Tongala (a prosperous township in the midst of a progressive irrigation area in northern Victoria) it was possible to visit and converse with several farmers.

The outstanding impressions obtained were the systematic way in which successive lots of lambs are grazed over small paddocks, the manner in which cereal crops are sown over the lucerne with the object of broadening the ration, the remarkable life of the lucerne under the treatment it receives, and the very profitable results obtained in fat lambs. Had the inquiry been extended to take in dairy practice also there is little doubt that the results would heve been quite notable—withal perhaps a little less striking.

Mr. H. Hanslow, of "Columbia" farm, Tongala, is the owner of 95¾ acres of irrigable land of good fertility, though a rather stiff clayey loam, with red clay 4 inches below the surface, and nodular limestone below that again—a formation favourable to good stands of lucerne. Under ordinary conditions the whole of the farm is under lucerne, but as most of the stands, if not all, are now twelve to fourteen years old, they are being renewed one after the other, so that at the present time there is not more than 76 acres actually under lucerne.

Keeping the "Tops" on Fresh Feed.

The essence of the grazing method adopted by Mr. Hanslow is to keep the sheep moving from one fresh paddock to another. Lambs in particular are dainty feeders, and if the pasture is fresh and sweet they make much more rapid progress than on ground that has been grazed over for some time. The attractiveness of the feed is secured by dividing the lucerne into small paddocks, and moving the mobs from one to another every few days, so that the whole of the pasture is fed off in a regular sequence. This little farm

is subdivided by substantial sheep-proof fences into seventeen paddocks, the average size of which is, therefore, less than 6 acres. The lambs are drafted off the ewes about the end of October, when the lucerne is coming away, and are put on a fresh paddock and moved every few days on to a fresh stand. As they improve and the time for marketing approaches, the forward lambs are drafted off as a mob of "tops," which are put ahead of the rest so that they get the freshest of the feed. A few weeks of such treatment puts a bloom on the lot that brings the highest price in the Newmarket yards, and following the trucking of the first lot any forward lambs are again drafted off the main mob, grazed ahead of the rest, and marketed in their turn. On these lines Mr. Hanslow gets high prices; he actually topped the market five times in one year.

No particular attention has been paid in the past to quick maturity, the object being rather to market "prime heavies" worth, say, £1 10s. to £1 15s., but on one occasion a line was exported and received very favourable attention in London. Latterly, however, the idea has commended itself to this farmer of giving more attention to early maturity, and developments are purposed in that direction.

The ewes preferred for the purpose have hitherto been big-framed, strong-woolled crossbreds, showing Border Leicester characters, and Border Leicester rams have chiefly been used as producing a lamb very suitable for marketing as "prime heavy," but last year the old mob of ewes was fattened off and disposed of, and 300 younger ewes of rather finer type and likely perhaps to suit the purpose of earlier maturity, have been purchased. The ewes are grazed on the lucerne behind the second mob of lambs, being used to clean up the stand before it is shut up and watered in view of the next growth of feed.

As the market affords opportunity store lambs are purchased and are grazed over the lucerne in the same way, the forward ones being kept ahead on the fresh feed and being marketed as they fatten. The lambs raised on the farm are dropped in June, shorn in October for about 3 lb. of wool per head, and then marketed in the autumn.

A certain amount of "plain country," outside the irrigation area has been leased from time to time, and is used in conjunction with the farm, but the total amount of grazing obtained in that way is not nearly equal to the amount of hay harvested on the farm and stored against future emergencies.

What Methodical Pasturing will do.

It is on these lines that a farm of 96 acres last year, between September and May (without any sheep on plain country), put off 700 fat lambs and 300 fat ewes, and in previous years has fattened as many as 1,000 lambs. The output, no doubt, looks large, and it is larger than that of most of the farms in the district, but Mr. Hanslow holds that it is not beyond the resources of many another irrigation farm in this portion of Victoria. In support of that view he quoted a neighbour with 107 acres, of which about

70 acres were under lucerne, who fattened 750 lambs between September and May on similar lines, carrying in addition 100 ewes on agistment for one month, sixteen milking cows and eight of their young stock, and three horses.

Further indication of the possibilities of intensive grazing under irrigation was afforded by cases quoted by Mr. Kendall. From one block of 26 acres, subdivided into eleven paddocks, in the season 1916-17, the holder sold 28 tons of lucerne hay, fed 35 tons of hay to live-stock on the block, and carried 250 sheep over the whole season, with two horses and three cows. On the adjoining 26-acre block, similarly subdivided into eleven paddocks, in the same season, there were carried two horses, six cows, twenty sows, one boar, and 225 sheep. Assuredly what can be done with irrigated lucerne systematically worked in small paddocks is astonishing!

Establishing a Lucerne Stand.

It is fitting, however, to return to Mr. Hanslow for the purpose of describing in more detail his method of cultivating and handling the lucerne. As stated above, his soil is a stiffish red clayey loam, which is a bit tricky to work, though if caught at the right stage perhaps not so difficult. By continuous work and good judgment this farm has been brought to a high state of cultivation, and is now much easier to work than years ago. Time was when eelworms infested the place, but under good husbandry, the spindly growth at one time common on the farm has been replaced by great vigour and abundance of growth, indicative of a healthier condition of soil. The whole area of the farm is irrigable, and has been graded and sown to lucerne in small paddocks.

Though the lucerne has been down for twelve to fourteen years, it is still in good heart, notwithstanding the close grazing it has received, but Mr. Hanslow values winter vigour in a lucerne stand, and he observes that it is young lucerne that chiefly exhibits that quality. It is with the object of ensuring good winter growth that he is at present renewing the paddocks, breaking up about 10 acres each year.

May is found to be the best month for sowing lucerne, because then, with the aid of irrigation water, it is possible to ensure practically optimum conditions. Spring sowing has the objection that the seed is very apt to miss on the check banks, which means loss of area under lucerne, and also loss of the banks themselves under the influence of summer winds, involving the working up of new banks. The best strike Mr. Hanslow ever got he secured from a February sowing, but it was rather a fluke, and May is most reliable.

Skinless barley at 40 lb. per acre is sown with the lucerne seed as a cover crop, which yields a cut of hay that pays for the cost of grading the land and working up the seed-bed. The lucerne seed is sown with two strokes of the drill, the second drilling crossing the first one, and both applying 5 lb. of lucerne seed, with 105 lb. superphosphate each time. With a view to

affording a bit more feed in the winter and covering up patches where the lucerne may be scalded out by water lying on the surface in summer, ½ lb. of wild white clover and ¼ lb. of *Lotus major* has been added to one recent sowing as a trial. Subterranean clover has been tried for this purpose, but "while all right in a pasture, it is no good among lucerne, tending to smother too much in the winter with us."

Renewing a Stand.

In the renewal of a stand of lucerne it is regarded by this farmer as essential that the old roots shall be thoroughly killed before re-sowing, and to ensure this two cereal crops are grown before the lucerne is sown again. In the case of one paddock on to which we walked, the first operation had been to plough the old stand to a depth of 4 inches with a disc in the autumn; then it was cross-worked with a one-way disc to fill up the furrows. About May there were many lucerne roots and crowns visible, and the hoes were taken off the drill and oats (of Mortgage Lifter variety) were drilled over the ground together with a bag of superphosphate to the acre (about 187 lb.). From this about 2 tons of hay was harvested in the spring, the stubble was grazed, and the one-way disc (which cuts up the old lucerne roots effectively) was put over the ground again. In the autumn the block was irrigated, worked up again with a scarifier with broad 5-inch tines (sharpened right up the shanks), and 2 bushels of Skinless barley with a bag of superphosphate per acre was sown. The oats had given a fine crop of hay, but the barley gave a marvellous winter growth. It may be remarked that oats seem to respond the better to irrigation, and to make the heaviest hay crop, but they do not compare with Skinless barley for bulk of winter feed. Six weeks after the crop of barley referred to above had been sown 300 ewes were turned into the paddock (7¼ acres) and left there for seven days. In seven or eight weeks the ewes, which had lambed in the meantime, were put back on to the paddock for eight days, after which the barley was allowed to run up and yielded about 1½ tons of hay per acre. Following the hay cart with a Wimmera scarifier and an application of water, Sudan grass seed (10 lb. per acre with the same amount of superphosphate as before) was drilled in; the roller and harrows followed, and three grazings of 600 or 700 sheep for several days each were obtained before the residues were ploughed in, and the land finally prepared for the sowing of the new stand of lucerne in May. By that time the land was in a thoroughly renovated condition, free from old roots, and formed a capital seed-bed. It may be said that prior to each cereal crop the paddock was graded, so that it was almost perfectly level when the cropping was over. As this soil is apt to set hard after irrigation, and thus to allow water to lie on the surface to the great detriment of the lucerne, a truly level surface is important.

The above story, with slight variations, was told in relation to two or three paddocks, and the conditions, in view of the establishment of new stands of lucerne, were remarkably favourable.

How Cereals are Combined with Lucerne for Grazing.

But it is not only in the renovation of the land once in twelve years or so that this farmer's method is notable. He subjects his lucerne paddocks to treatment every year that many would regard as excessively severe.

In February it is eaten down close (so close that there is hardly a vestige of green to be seen on the crowns), then irrigated, and cultivated twice with the rigid tine scarifier as soon as it will carry the horses. The first time the scarifier will only go 2 or 3 inches deep, but the second time it is got down 4 inches, five horses being required to draw a 9-tine implement. Then the drill follows, sowing 110 lb. superphosphate and 1½ bushels of oats or barley—these two cereals being alternated year by year. The sowing is finished by rolling the ground to pack the seed down, and then harrowing to leave the surface loose.

A rapid and abundant growth of lucerne and cereal takes place, and in six to seven weeks sheep are on the ground. Mr. Hanslow relates that, whereas years ago when grazing lucerne only, he used to lose many sheep by bloat (or hoven), since he has adopted the practice of growing cereals over lucerne there have been practically no such losses, and the gain in this respect is quite enough to cover the cost of sowing the cereals over the lucerne. It is timely, perhaps, to pause to remark that the mixed feed afforded by the lucerne and cereal is really a solution to the problem of the unbalanced ration afforded by lucerne alone. At Werribee a broader ration has been afforded by the mixed pasture of grasses and clovers. At Tongala it has been obtained by growing the cereals over the lucerne.

From each of the paddocks with barley or oats in association with the lucerne several grazings are obtained through the autumn and winter, the mixture affording a highly nutritious and palatable fodder on which the sheep fatten rapidly. In the spring the stock are excluded, and a crop of hay is harvested. "I know this mixed hay is not on the market, but it makes excellent chaff, and stock take quickly to it." Then Mr. Hanslow pointed to a yardful of stacks of lucerne hay and of the mixed cereal and lucerne, and intimated that it all meets a good demand in dry seasons in the Riverina and northern Victoria. While he does well fattening lambs in average seasons, Mr. Hanslow awaits with confidence the liquidation of the hay.

It may be remarked that winter cultivation of lucerne, once recommended in the district, is not favoured by this farmer, the difficulty being to get the soil in the right condition for working at that time of the year. "It is either too wet or too dry," he says, whereas in the summer it is possible, with the aid of irrigation, to bring the soil to a suitable condition by artificial application of water. There is no doubt in his mind, too, that cultivation is well worth while. The value of top-dressing lucerne with superphosphate has been so apparent to Victorian farmers that pretty well everyone is now doing it, and up to 2 cwt. per acre is being used. "But don't imagine that you can avoid summer cultivation of your

lucerne by increasing the superphosphate," says Mr. Hanslow, and he points to two small paddocks adjoining one another. One received the ordinary cultivations when a cereal was being sown, plus one bag of superphosphate per acre, while on the other (contrary to intention) the cultivation was missed and two bags of "super" were put on "to make up." Valuable as is superphosphate, the result was emphatically in favour of thorough cultivation.

On a soil naturally rather stiff, and subjected, as this is, to a good deal of trampling, there is considerable danger of water lying on the surface after irrigation and the lucerne being scalded. To prevent this the surface has to be broken up from time to time, and the cultivation given in various ways is therefore important to the preservation of the life of the lucerne.

Methods that Ensure best Results.

Every grazier knows the tendency for sheep to nip the green leaves off lucerne and to allow the stalks to remain, and every grazier who has watched his lucerne stand with care knows the tendency of the next growth to shoot from those stalks instead of from the crown, with the result that the amount of feed obtained is seriously reduced. Victorian graziers attach the greatest importance to the mowing of the stalks immediately the sheep have been removed, and before the water is turned in. Some men fire the stalks where they lie a day or two after cutting, and then let the water on, sometimes even watering twice before the sheep are turned in again. The lucerne is allowed to make a full growth and to be about one-tenth in bloom before the sheep are turned in. The hard grazing Mr. Hanslow gives a stand—eating it off to the crowns—makes it essential that time be given for the roots to recover before being cropped so close again.

Another Farmer's Practice.

Another type of grazing proposition, under hardly such intensive conditions, is practised by Mr. W. B. Lloyd at Stanhope, about 17 to 20 miles away. Here the total area of the farm is 476 acres, of which 200 acres are under irrigation, the greater part carrying lucerne. Here also the paddocks are small, averaging about 10 acres each, though the owner readily acknowledges they would be more profitable if smaller still. The essence of Mr. Lloyd's method is much the same as Mr. Hanslow's—the sheep being grazed on the paddocks in rotation, and the "top" lambs being kept ahead of the others on clean growth.

Preference is given to the fattening of lambs, and ewes are kept from which lambs are raised, but a good deal is also done in the way of buying store lambs and fattening them. In fact, these Goulburn Valley farmers look forward to the day when, instead of western Riverina store lambs being railed to Melbourne for sale, they will go direct to some centre in their own locality, thus saving freight and handling. Forward lambs of fourteen to fifteen weeks are preferred by Mr. Lloyd, and it is found that

if they have come off dry country they can be topped off and made really prime in three weeks. When drafting the lambs in the crush every animal is felt, and the tops are put ahead of the rest, being kept until they are thoroughly prime. A distinction is made between "fat" and "prime." Lambs may leave the farm "fat," and yet have lost weight and bloom by the time they come under the hammer. Mr. Lloyd considers it is the last fourteen days that makes the difference, and he keeps them until they are sound enough to stand the journey, and still be "prime" when they are sold.

In that last couple of weeks they are allowed a bit of dry feed by being admitted to a stack of lucerne hay from which they can pick as they wish. Practically every paddock has a small stack at hand, enclosed by wire netting, which can be removed as desired. The effect is to give the lambs rather firmer condition than if they are marketed straight off lucerne only. Some farmers prefer to put the dry feed out as chaff in feeders, and certainly this keeps the wool cleaner than when the lambs have access to a stack, but it involves more labour.

The "top" line being away, the next draft of lambs is finished off as soon as possible, and the business goes on thus throughout the season.

The ewes used on this farm are frequently lines of faulty and failing mouthed ewes, which are picked up in the saleyards. On arrival at the farm each animal is "mouthed," and those sound enough to raise a lamb are put aside, while the others are run with the second lot of lambs—never with the "tops." Often there are three mobs following one another over the successive lucerne stands—the first being the "top" lambs, the second the balance of the lambs and the rejected ewes, and the third the ewes that are being kept for next year's crop of lambs. Good money seems to be thus made out of old ewes, whether they only remain on the farm a few weeks or whether they are kept long enough to rear a lamb and yield a fleece before being fattened off.

More Lucerne Experience.

Here, as at Tongala, importance is attached to the mowing of the stalks after the third mob has been removed from a paddock and before the water is turned in. An 8-foot mower is used with two horses to get over the ground quickly and get rid of the objectionable stalks. Following this the head ditch is opened, the stand flooded, and the paddock then shut up until it is one-tenth in bloom. It was gathered that the forward mob of "tops," say about 200 to 250, will be on a 10-acre or 12-acre block of lucerne for, say, four days; then the second mob of, say, 400 to 500 lambs and old ewes may be on it for another four days; and finally 200 to 250 ewes, forming the third mob, will be two or three days cleaning up the ground. It is generally reckoned here that a 10-acre block of lucerne will give quite ten or twelve days' feed for such mobs. The stalks having been mowed, and the ground watered, it will be four to six weeks, according to season, before the growth is good enough for sheep to be turned in again.

The first watering must equal about 4 inches, and each one thereafter 2 inches. It seems to be agreed that frequent small waterings give the best results, but are not practicable, involving too much labour. As it is, most irrigation farmers find a certain amount of attention at night is essential in order to ensure that each bay gets its right amount of water. Importance is attached to "getting the water on quick, and getting it off quick." It must not lie on the surface, or scalding will result.

Winter cultivation of lucerne is being dropped on a good many farms, and summer cultivation is objected to by Mr. Lloyd on the ground that there is too much else demanding attention just then. Sometimes he cultivates oats into a stand of lucerne in February or March, and a good dressing of superphosphate is given at the same time. "It gives a mixed feed and freshens up the lucerne," and, though unknown on the market, makes a valuable, nutritious, and palatable hay. A bag of superphosphate per acre has been found profitable—distinctly more so than half a bag.

Great advantage has been found to accrue from a "burn" in the spring. It is believed locally that the effect is to destroy fungus troubles that are apt to affect the leaf. Certain it is that if the winter growth is cut with the mower, allowed to dry where it falls, and then burnt with a light, quick-running fire before watering, the effect on the next growth, both in regard to freshness of the leaf and vigour, is remarkable. In one case in Stanhope district it is said such a burn was followed by a better yield than an application of eight bags of superphosphate on an adjoining block of 10 acres. It has been suggested that the potash made available by the burn had something to do with the result, but manuring with potassic manure has failed to show the same effect. It may be repeated that the lucerne must not be drawn into heaps for this firing, or the lucerne will be killed in patches.

On low patches, where the lucerne is apt to be killed out by scalding, Mr. Lloyd has sown clovers and grasses which seem to relish damp conditions, and the effect has been satisfactory—"but don't use paspalum," he added.

There are three essentials to success with fat lambs in Mr. Lloyd's view—

(1) Plenty of fresh, sweet feed.
(2) Plenty of clear water for drinking.
(3) Plenty of shade.

On the third point, he added that every paddock should have shade. He has observed that the lambs feed in the morning, seek shade during the heat of the day, and move out to feed again in the evening. If shade has to be planted—none having been left when clearing the ground—the trees should be planted several in a circle or group and fenced in. Individual trees are not so satisfactory.

With 200 acres of irrigated lucerne closely subdivided Mr. Lloyd reckons it is quite possible to carry 2,000 sheep, and in his view there is no reason why in times of drought a great many more should not be carried, providing hand feeding and not grazing is adopted.

A Larger Property.

That the fattening of lambs on lucerne on the lines indicated is practised by quite a number of farmers in this part of our neighbouring State will no doubt be gathered. The two farmers whose methods we have described are perhaps more systematic than most, but in a general way a good many are operating on similar lines. The majority of the properties are, of course, small, but a few details may be given of a larger farm where something the same is going on.

Messrs. Telfer Brothers, "Hyde Park," Kyabram, are located something like 20 miles from either of the other farms described. They are the holders of about 1,300 acres, of which rather under 300 acres are under lucerne, some of which is getting a bit old. They are best known as the owners of a choice little stud of Suffolk Downs, and they have not adapted their lucerne to grazing off in such small paddocks as the other cases described. They, however, run a flock of 700 or 800 comeback ewes, the lambs from which, together with stores purchased for the purpose, are grazed on lucerne blocks, which run about 30 to 40 acres each. In the absence of close subdivision and regular movement of the lambs from one to another, these farmers do not attain the high output of Mr. Hanslow or Mr. Lloyd, but they nevertheless market over 1,000 fat lambs in a season. As the lucerne also yields at least 40 or 50 tons of hay per annum, it may be said that four fat lambs per acre are put off the lucerre each season. Messrs. Telfer favour the method of dividing the lambs into two lots and keeping the forward lot ahead of the other one, so that they get the advantage of the clean pasture, while a mob of ewes or backward lambs is grazed behind all. As a rule the "tops" are kept about ten days on a paddock, and the "seconds" perhaps less, but the ewes, which make the cleaning up mob, may only get a day or two's grazing. As with the other farmers, the stalks are mowed immediately after the ewes are removed, and the water is then turned in. Grazing commences when the lucerne is about 20 per cent. in bloom: if left till later the lambs simply pick the leaves and leave too much stalk.

The first watering of the season is always the heaviest, and water is applied at least once after each feeding off, though a second watering is often profitable if it is possible.

These farmers crop some 300 acres for wheat every year, so that their operations are on a more diversified scale than those to whom we have devoted more space, but their practice goes to show that the intensive grazing of lucerne in the Goulburn Valley has sanction on even a larger class of farm.

Apart from the value of many of the details which the farmers we conversed with were good enough to afford for the benefit of New South Wales readers, we have perhaps shown that the methods described are not those of isolated men, but that, in general principle, they are being practised by a considerable number of farmers in their localities, and on properties varying widely in area and general conditions.

Staggers in Stock due to Rough-bearded Grass (*Echinopogon ovatus.*)

H. R. SEDDON, D.V.Sc., and H. R. CARNE, B.V.Sc.

In 1911 Henry and Massy (*Agricultural Gazette of N.S.W.* Vol. 22, page 116) recorded an investigation by the former into a peculiar form of staggers which occurred in certain parts of the New England district. This form of staggers, it should be noted, is quite distinct from the staggers or shivers found to be due to Mallow (*Malva parviflora*), Stagger weed (*Stachys arvensis*) or *Lamium amplexicaule*.

Though for some time local residents have ascribed the condition to the eating of *Echinopogon ovatus*, such had not been definitely incriminated at the time these investigations were undertaken.

Experimental Work with Natural Cases.

Two sheep affected with the disease were despatched from Emmaville on 28th September, and arrived at the Veterinary Research Station on 30th September, 1924.

Examination on arrival showed the following :—

No. 1. Merino wether lamb (affected about a week).—Left eyelid markedly swollen and muco-sanguineous discharge from between lids which were almost closed. Animal in rather poor condition.

No. 2. Merino wether lamb (affected about three months).—Lower lip pendulous due to an old tear to right of median line, wound quite healed. Gum around incisor teeth (labial surface of mandible) excoriated and roughened from contact with ground whilst feeding. Animal somewhat poor in condition.

Symptoms noted in both Animals.—The forelegs showed marked lack of flexion at knees, the whole limb being extended stiffly forward from the shoulder with the leg held straight. When stopped after walking both forelegs were placed together, but with the feet placed far forward, *i.e.*, about 6 or 8 inches anterior to the perpendicular from the shoulder.

The hind legs were only slightly flexed at the hocks and stifle, movement being chiefly from the hip joint. The limb was carried in the same stiff manner as the fore limb, but instead of being brought straight forward the foot was swung outwards, and this was accompanied by a swaying movement from the loins, especially in the case of No. 2.

The whole gait was therefore very stiff and ungainly from lack of normal flexion. In general appearance both sheep presented a somewhat "silly" look with some swaying of the body.

The appetite of both sheep was good. No. 1 was placed on grass pasture. Examined four days later symptoms were much less severe, the animal showing only slight stiffness of gait. Thereafter symptoms decreased

further so that after a fortnight the sheep travelled 3,000 yards with an almost normal gait. There was, however, a rather shaky carriage of the head, attributable probably to partial loss of sight in one eye.

No. 2, the day following arrival, was fed on *Echinopogon ovatus* supplied from the same locality as the sheep. The following day symptoms were aggravated and the next day the animal was found down in the morning. When lifted to its feet it moved about with a very awkward stilted gait. There was now almost continuous wobbling of the head and neck. When chased round the yard the animal was unable at times to control its forelegs, and as a result fell down on its brisket and endeavoured to continue moving by pushing the body along with the hind limbs.

Next day (fourth day of *Echinopogon* feeding at the Veterinary Research Station) symptoms were still very marked, and it was noted that when standing the animal held its legs widely apart in order to preserve its balance. During the ensuing three days the animal was fed on green barley and at the end of that time had improved to the extent that it now presented much the same symptoms as when it first arrived.

The following day (8th October, 1924) the animal was killed by bleeding, and a post-mortem examination made. Beyond slight emaciation no gross abnormality was detected in the musculature or internal organs.

A few parasites (Hæmonchus, Moniezia and Trichuris) were found in the abomasum, small intestine and cæcum respectively. There was no excess of cerebro-spinal fluid and the brain, cord and meninges appeared normal.

Culture media sowed from blood and internal organs remained sterile. Nervous tissue was taken from both fore and hind limbs, and with the spinal cord was examined histologically, but no gross changes were detected. No gross changes were found microscopically in the liver, spleen or kidneys, but the lymphatic glands were somewhat œdematous.

Experimental Feeding of *Echinopogon ovatus*.

In addition to the feeding of an affected sheep (No. 2) as above, a Merino lamb (No. 91) was fed on the same supply of the grass. This was commenced on 1st October and was continued with such grass as was available till eight days later. During the latter part of the period the grass used was somewhat damaged by mould. Sheep 91 ate in all 6¼ lb., the grass being harsh and unpalatable.

Result.—No alteration in gait or other symptoms of illness were observed.

Later in the season it was arranged to have supplies of freshly-cut *Echinopogon ovatus* collected at Emmaville and forwarded every other day. With this the following sheep were fed: -

Sheep Nos. 45 and 56 (full-mouthed Merino ewes) were given as much of the grass as they would eat. The feeding was commenced on 7th November, 1924, and continued for three weeks, during which time the animals consumed about 66 lb. between them (*i.e.*, 1·56 lb. per diem each).

Result.—No symptom of illness or disorder in gait were observed.

Sheep Nos. 100 and 101 (Merino lambs, recently weaned) were penned with the above and given the grass *ad libitum*.

Result. No. 101 fed for thirty-one days, consumed about 29½ lb. grass (average less than 1 lb. per diem) and remained normal.

No. 100 fed for forty days consumed 38½ lb. (average less than 1 lb. per diem). On the 20th day it was noted that when standing in the pen this lamb moved its head about a little in a curious nervous up and down and side to side fashion. On the 26th day this lamb (along with No. 101, which remained normal) was placed in the yard and allowed to move round quietly. Particularly when standing still the lamb was noted to hold its head slightly depressed to the left, and at the same time to show an apparently quite involuntary constant slight side to side movement of the head. When made to move up and down the yard quietly it appeared unduly timid, making sudden little runs and then stopping as suddenly. At the trot the forelegs were carried very stiffly, there being very little carpal flexion, and when the animal stopped it each time took up an attitude with the forelegs placed well forward as if it were standing on a downward slope and propping to prevent slipping down, or as if resisting a push from behind. At the same time the hind limbs were placed further apart than normal, and flexion at the stifle appeared to be somewhat greater than normal. The sheep were then made to move at a faster rate around the yard. Sheep No. 101 travelled normally. No. 100 showed progressive abnormality in gait. Driven fast twice up and down the yard (60 feet long) it commenced to move in a series of bounds. The fore limbs showed marked lack of flexion and were moved either together or at a trot, but the limbs seemed to lose their usual concerted action and were kept in a more or less fixed semi-flexed condition, both limbs being moved simultaneously. The whole gait had the appearance of a succession of proppy bounds.

On being driven up and down a third time No. 100 after turning gave one or two little leaps into the air off the hind limbs and then appeared to lose its equilibrium, falling down on its side and struggling violently to regain its feet. It continued to struggle for over a minute before it managed to get up, when it bounded off and in a few moments stood quietly and started to pick at some grass in the yard. Driven quietly it was now able to move around but with much the same stiff gait as when first brought into the pen.

Thereafter it was tested by driving almost daily, when similar symptoms would be evinced. The succession of bounds usually ended by the animal standing on its hind legs with forelegs outstretched and then falling over backwards. There was, however, gradually greater difficulty in eliciting symptoms, the animal requiring more driving to bring them about. Thus on the thirty-ninth day it took a full ten minutes' driving at a fast pace, and then the only symptom was the sudden repeated bounding—no falling over backwards. On the fortieth day the animal was placed at pasture and rapidly regained normality.

A yearling calf was penned on 1st December (twenty-four days after the feeding of the last sheep began) and was fed the grass *ad libitum.* The animal did not relish the plant, and further, as the supply from the eighth day became insufficient to keep the calf on *Echinopogon* alone, a small feed of wheaten chaff was allowed thereafter for the evening meal, the grass being fed in the morning. The experiment was continued for twenty-five days, during which time 192 lb. of the grass was eaten. The animal was exercised repeatedly during the course of the experiment, but neither in the pen nor at exercise did it show any symptoms of the condition.

Condition of plant fed.—Sheep Nos. 100 and 101 : At the commencement the grass was young and fresh, and apparently a pure sample. Only an odd flowering head was present. As it arrived at the Veterinary Research Station in a damp condition it was spread out to prevent moulds developing. During the progress of the experiment the plant became harsher and the flowering heads more numerous, so that at the termination there were a large number of these present. Calf : The plant supply used consisted largely of flowering heads.

Summary of Experimental Work.

1. The removal of an affected sheep from a diet containing the suspected plant led to a marked improvement in four days and complete recovery within a fortnight.

2. The feeding of *Echinopogon ovatus* to an affected sheep sent down to the Veterinary Research Station (and therefore not receiving the grass for the two days occupied in transit) led to an aggravation in symptoms.

3. Feeding experiments with the green *Echinopogon ovatus* sent from the district in which the complaint occurs resulted as follows :—

Sheep Nos. 45 and 66 (adult sheep) consumed an average of 1·56 lb. each per diem for three weeks, but showed no symptoms of the disease.

Sheep No. 101 (lamb) consumed an average 1 lb. per diem for thirty-one days and remained normal.

Sheep No. 100 (lamb) fed at the same rate for forty days, showed very definite symptoms, commencing on the twentieth day, but most marked from the twenty-seventh to thirty-fifth days and then recovered.

Calf No. 10 (a yearling) fed for twenty-five days, consumed 192 lb. of the grass and remained normal.

4. The failure of the grass to affect other than young sheep and then only after prolonged feeding lends support to the local opinion that—(*a*) young animals are most susceptible, (*b*) that the grass loses some of its harmful properties after it is cut, and (*c*) that when seeded it is not as harmful as when in active growth. (Further work on this phase is being undertaken.)

Summary of Knowledge regarding the Condition.

Although, as mentioned earlier, a short account of the condition has already been published, yet in view of the fact that this was so long ago (1911), and of further information obtained from later reports by field

officers, and especially of the result of our experimental work, it would seem advantageous to give the following short account of the condition as we know it up to the present. The last report was furnished at the request of one of us (H.R.S.) by Mr. W. L. Hindmarsh, B.V.Sc., District Veterinary Officer, who visited the locality since the above-recorded experimental work was conducted.

Cause.—Ingestion of rough bearded grass (*Echinopogon ovatus*).

Locality Wherein Disease Occurs.—New England district, particularly around Emmaville. Disease occurs over an area of about 2,000 acres. The grass, it may be mentioned, grows widely through the State, but is not plentiful except in the part mentioned. In the Emmaville district the grass seems to be slowly spreading, so that if it becomes at all plentiful it may be found later to affect stock in adjoining districts.

Class of Country.—"Traprock" country. Very stony and ridgy. The stone outcrops are so numerous that on the whole of one property visited it is said that there are not 2 acres that can be cultivated. At the cost of much labour this owner has a small area cleared of stones for a vegetable garden.

Vegetation.—The disease is said to occur only on that land on which the bush has been "ringbarked" and more or less cleared—thus allowing of extensive growth of grasses. This spread in the cleared country is favoured by the fact that the grass seeds profusely and stock do not eat it unless there is no other food.

The original timber (trees) consisted mainly of ironbark, but stringybark and box were also present. At that time (March, 1925) the vegetation consisted of scattered trees, and the main grass was *Echinopogon ovatus*, which at that time covered the paddocks in tufts about 2 feet high and from the heads of which the seed could be rubbed out freely.

Seasonal Occurrence.—Disease most prevalent in late winter and early spring at which time the *Echinopogon* is more plentiful than at other seasons; other grasses having then been eaten down, stock are forced to eat the *Echinopogon*, which is then making rapid growth, and which otherwise they are inclined to avoid as it is harsh, somewhat bitter and apparently decidedly unpalatable. When the grass dies off, the stock, if not very badly affected, recover naturally.

Stage at which the Grass is Harmful.—Local opinion is to the effect that the grass is harmful only up to the time that it seeds. It must be pointed out that at that time the grass is more plentiful than at other seasons, and further that through absence of other feed, stock are forced to eat it. Nevertheless, certain of the experimental work seems to bear out the contention that it is the young grass that is most harmful.

Animals Affected.—All classes of domesticated animals appear to suffer. Young animals appear to be most susceptible, though older stock are not immune. The losses are chiefly in lambs, calves and young goats. These latter animals, however, under certain circumstances appear to suffer less

acutely, and this is attributed to their eating suckers, gum leaves, &c., in addition. One owner states that after eating the green seed heads, turkeys will stagger and fall over. So badly does it affect young stock that it is almost impossible to rear them.

Symptoms.—The first noticeable symptom is that the animal stands with the back arched, swinging the head gently up and down and may be from side to side. On movement there is marked stiffness in action, the carpal and tarsal joints being little if at all flexèd and the limbs flung forward in a stilted manner. The animal stands with the forelegs extended and the hind spread widely apart.

In more severe cases there is incoordination of movement of the legs, the animal going forward by a series of bounds. Finally, loss of equilibrium occurs and the animal falls, lying on the ground with legs stiffened and unable to get up. It is said that the animal always falls on the same side. Such falls are especially liable to occur when the animal is turning. When down convulsive struggling, accompanied by sweating and rapid breathing, occurs, and animals may roar as if in pain. Allowed to remain quietly the animal recovers somewhat, and after some minutes is able to get up, but the stiffness of action and the shaking of the head, present before the more acute symptoms brought about by the enforced exercise, still persist. In the most severe type of case there appears to be marked hyperæsthesia and acute symptoms may be brought on by such slight excitement as the sudden appearance of a dog or even of a man.

In the field, it is said that if animals fall in awkward places they may be unable to rise, and die in that place. Particularly is that so if the head be pointing down hill.

In chronic cases the animal walks stiffly, and if approached runs away in a curious manner, the hind legs being moved simultaneously although the forelegs trot. One owner states that there may be some hoven but it is not very marked.

General effect on the Animal.—Animals depastured on the grass for some time exhibit more or less emaciation, such perhaps being partly due to inability to travel and forage for food.

Mortality.—In young animals this may be very heavy but such is usually the result of accident and due to the presence of obstacles in the way of holes, fallen trees and creeks, which prevent a fallen animal regaining its feet. On one property quite a number have been drowned in a dam.

An example of the mortality that may occur is furnished from the record of one settler. At the spring of the year he had 600 sheep and from then till the autumn all became affected except five. He "marked" 260 lambs and in two weeks he had lost 86 of them. His total losses for the season were 140.

Post-mortem Appearances.—When animals have been affected for some time there are lesions of emaciation, but otherwise there are no gross changes present. Injuries, from knocking against fallen trees, stumps, &c., are common.

Time of Feeding to Onset of Symptoms.—This seems to depend on three factors :—(*a*) Age of animal (susceptibility decreasing markedly with age); (*b*) stage at which plant is eaten; (*c*) amount of plant eaten.

Precise information on these points has not been obtained, but there appears no reason to doubt the opinion of local settlers, who state that the grass is most harmful when young. At the same time it must be pointed out that that seems the time when the plant is most likely to be consumed in quantity. Our experiments show that late in the season an amount of 1 lb. per day led to slight but definite symptoms after twenty days' feeding, becoming severe after twenty-five days, and extending till the thirty-seventh day after feeding commenced.

In the locality wherein the disease occurs symptoms are said to ensue—at least in cattle—after as short an interval as one or two days. Two precise cases may be quoted. (1) A heifer brought on to the property showed effects of the grass in fourteen days; (2) a pound-keeper was driving cattle through the same property and left them there for two nights. They were young steers—number unknown—and were staggering when leaving. These cattle were empty and hungry when they arrived on the property, and probably gorged themselves.

Prevention and Treatment.—No method of prevention is known, though slight benefit is said, by one settler, to follow the use of magnesium sulphate incorporated in a salt lick. The same farmer claims good results in treatment of affected animals with magnesium sulphate and molasses.

As animals recover within a few days after being removed from lands grassed with *Echinopogon*, the most satisfactory method of dealing with the complaint has been found to be the provision of small "hospital" paddocks for affected animals, *i.e.*, transferring them for a few days to an area wherein *Echinopogon* is not present, or where it is sparse and there is other feed, in order that they may recover therein. In the locality involved, however, such areas are of only small extent and it is impossible to handle large flocks in this way.

Summary.

A peculiar form of staggers occurring in the New England district of this State is associated, according to local opinion, with the ingestion of rough bearded grass (*Echinopogon ovatus*), and experiments have shown that the symptoms of the condition may be induced by feeding a lamb on this grass. A preliminary account of the disease in the light of our existing knowledge is presented.

Our thanks are due to Mr. Max Henry, Chief Veterinary Surgeon, for his permission to include herein the result of his earlier field investigation on this condition, and the reports of his officers, Mr. C. L. O'Gorman, Senior Veterinary Surgeon, and Mr. W. L. Hindmarsh, District Veterinary Officer.

Field Trials with Sweet Potatoes.

Wollongbar Experiment Farm.

R. N. MEDLEY, H.D.A., Experimentalist.

A VARIETY trial with twenty varieties of sweet potatoes was carried out at this farm during the 1925-26 season.

The soil on which the trial was conducted is of red volcanic nature; it had been previously sown to sorghum for green feed purposes, but on account of insufficient growth the crop was ploughed under. The land was ploughed on 20th July, 1925, harrowed 1st August, 1925, ploughed 20th August, 1925, harrowed 7th September, 1925, and ploughed and harrowed on 3rd and 4th December, 1925.

All varieties were planted out on 6th and 7th January, 1926, in rows 3 feet apart, the sets being spaced 2 feet apart in the rows. The rainy conditions prevailing at planting time materially aided the very successful strike which was obtained. Growth during the first month was very vigorous, but the plants received a severe check by dry conditions during February

The rainfall during the growing period was as follows :—

	Points.
January (6 to 31) ...	287
February ...	89
March ...	650
April... ...	581
May	520
June (1 to 9) ...	226
	2,353

Cultivation was carried out between the rows to keep down weed growth, which at times was very vigorous. The top growth of the potatoes was fairly heavy and the roots formed in large numbers, but a large proportion failed to fully develop into marketable size.

Harvesting was carried out on 9th, 10th, and 11th June. The results were as follows :—

Variety.	*Approximate yield per acre.* T.	cwt.	qrs.	lb.	*Variety.*	*Approximate yield per acre.* T.	cwt.	qrs.	lb.
Boyne River	5	2	0	16	Mammoth Cattle	2	1	0	3
White Yam	3	17	0	0	White Belmont	1	16	2	18
Pink Fiji	3	13	0	8	Brook's Seedling	1	16	1	10
Vitamine	3	11	3	1	White Maltese ...	1	8	2	23
Nancy Hall	3	9	3	10	Georgia	1	8	0	17
Director	2	19	3	1	Pierson	1	7	3	1
Brook's Gem	2	18	1	27	Yellow Strasburg	0	16	3	10
Southern Queen ...	2	14	1	10	Red Carolina ...	0	14	2	16
Madiera	2	12	3	1	Triumph ...	0	9	0	6
Farmer's Special ...	2	9	3	0	Porto Rico ...	Failed.			

Harvesting, though carried out when the roots had matured, was hastened by many of the roots showing signs of sprouting, no doubt owing to the unseasonable conditions, there being a rainless period of four weeks during

the latter part of April and early May followed by some ten days of continuous rain. This would also account to some extent for the low yields obtained. Heavier yields would have been obtained had it been practicable to allow the roots to remain in the soil for a longer period before digging.

After harvesting, the roots were spread out in a well ventilated loft, so as to enable observations as to keeping qualities to be made, but up to the early part of July only those roots damaged during harvesting had shown signs of decay.

Notes on Varieties.

Boyne River.—Top growth light; roots long, irregular in shape, white skin and flesh; fairly good cooking variety.

White Yam.—A consistent yielder at this Farm; fairly heavy top growth roots rounded, ridged, white skin and flesh; good cooker.

Pink Fiji.—Also a consistent yielder; large roots, regular in shape, purplish skin and flesh; a very good cooking potato, but on account of its colour it is likely to be neglected for market purposes. Vine growth light, leaves large, deeply indented.

Vitamine.—Foliage dense and clumpy; roots elongated, regular skin, and flesh light yellow; fair cooker.

Nancy Hall.—Foliage light; roots small, spherical; skin and flesh yellow; a good cooking type.

Director.—Heavy foliage, leaves angular; roots elongated, large, even in size and shape; medium cooker.

Brook's Gem.—Heavy foliage; very distinctive rounded crinkled leaves; medium sized roots, light yellow skin, white flesh; fair cooking variety.

Southern Queen.—Vigorous vine growth; roots roundish, regular, medium size, yellow flesh.

Madiera.—Medium heavy foliage, heart shaped leaves; roots light, yellow skinned and fleshed, large round, crack badly; good cooker.

Farmer's Special.—Very heavy foliage, angular leaves; long narrow roots, white fleshed.

Mammoth Cattle.—Heavy foliage; medium sized roots, irregular in shape; appears to be mixed.

White Belmont.—Mixed or wrongly named; roots pinkish, skin and flesh pink mottled with white; round in shape; cracks badly.

Brook's Seedling.—Dense foliage; roots white skinned, light yellow flesh, uneven in size, round shape; good cooking type.

White Maltese.—Rather bushy top growth; roots elongated in shape, white skin and flesh; slightly mixed.

Georgia.—Heavy growth, large leaves; roots large, uneven in shape; high proportion of small roots; white skin and flesh.

Pierson.—Heavy top growth; white skin and flesh; roots long, uneven size; very good cooker.

Yellow Strasburg.—Foliage fairly dense; roots uneven in size, round, cracks badly; flesh yellow and coarse.

Red Carolina.—Heavy vine; roots round, uneven in size, cracks badly, pink skin, mottled flesh.

Triumph.—Very much mixed.

Grafton Experiment Farm.

G. NICHOLSON, H.D.A., Experimentalist.

A variety trial was carried out last season with the seventeen varieties of sweet potatoes.

The trial was originally planted on 26th and 27th October, on a light sandy soil. Exceptionally heavy rain early in November washed out a large number of the plants and scoured the land badly. Replanting was carried out on a red volcanic soil merging into a sandy loam. The land, which had previously been cropped to maize for green fodder, was disc-ploughed 20th April, harrowed 25th May, disc-harrowed 22nd May and 15th July, harrowed 17th August (after a fall of 2¼ inches), mouldboard ploughed 15th September, and disc-harrowed 1st October. During the latter part of October it was planted to sorghum, but the greater part of this was washed out by the November rains. The soil was stirred and levelled with the aid of the spring-tooth cultivator and harrows, which put it in fairly good order for planting.

Planting was carried out on 17th November, and on 15th December, all misses and incomplete plots were filled up. Two rows, 3·3 chains long, were planted of each variety. Rows were spaced 3 feet apart and 4½ feet between varieties, rooted cuttings being dibbled in on the flat every 18 to 20 inches in the row. Moisture conditions were favourable at both plantings, and approximately a 100 per cent. strike was obtained.

The Season.

The rainfall was somewhat erratic. The November rainfall was the highest for many years and probably constitutes a record. Sufficient rain fell during December and January to meet requirements, the vines making satisfactory growth. From 21st January to 17th March, a period of eight weeks, no effective rains were recorded. By the latter part of February the vines were showing the effects of the hot dry spell, and had commenced to die back. The March rains were only sufficient to revive the vines and insufficient to

promote vigorous, fresh growth. Moister conditions prevailed during April and May, but owing to the shorter days and cooler nights, the potatoes did not make very rapid growth. Quite a number of varieties produced a large number of small under developed roots. No doubt had seasonal conditions been more favourable the major portion of these would have developed into medium sized potatoes. The rainfall was as follows :—

	Points.
November (17 to 30) ...	65
December ...	272
January ...	470
February ...	Nil.
March ...	163
April... ...	282
May	301
Total ...	1,573

Cultivations between the rows were carried out on 1st and 22nd December. By the middle of January the majority of the varieties had sufficiently covered the land, and further cultivation was unnecessary. The plots were harvested between 28th June and 1st July. The results were as follows :—

Variety.	Small tubers.	Yield per acre.				Average yield for two years.			
	Per cent.	T.	cwt.	qrs.	lb.	T.	cwt.	qrs.	lb.
Georgia	7·8	10	3	0	1	7	18	3	17
Yellow Strasburg	18·2	8	7	2	3	9	2	3	17
Brook's Seedling	19	6	13	3	20	7	8	0	14
Bon Accord	11	5	18	3	16	6	2	0	14
Brook's Gem	52	5	14	1	20	6	6	3	19
White Yam	24·1	5	9	0	3	6	8	0	20
Nancy Hall	14·4	5	7	2	13	7	7	2	20
Director	31	5	6	0	23	7	17	0	20
Farmer's Special	39·7	5	2	0	23	5	19	0	20
Southern Queen	25	5	1	0	4	6	11	1	0
Vitamine	30·5	4	17	0	4	6	1	0	25
Porto Rico	16·8	4	14	3	20	4	19	1	26
Boyne River	23	4	12	0	12	5	18	3	26
Mammoth Cattle	22·5	4	1	2	4	8	9	3	12
Triumph	36	3	13	1	7	3	16	3	24
Pierson	35	1	17	2	11	....			
White Maltese	......	Failure (diseased).				....			

All potatoes with a diameter of less than 1½ inches were classed as small. With a few exceptions there were no very large coarse roots, the majority of the large potatoes being of good marketable size, and of medium length.

Remarks.

Yields, on the whole, are considerably below those of the previous season. Some factors that may be responsible for lower yields were :—

(1) Lower and erratic rainfall.

(2) Cuttings planted out in October were transplanted in November, resulting in a hardening off and general stunting of growth. It was clearly demonstated that fresh cuttings from the seed-bed developed more vigorous and healthy vines and produced tubers of greater uniformity.

(3) Compaction of the soil due to heavy November rains, followed by hot dry weather.

(4) Dry weather shortly after the roots had commenced to develop. Eight weeks dry hot weather seriously affected the growth. Effective rains did not fall until April, and by that time the days were shorter and the nights cooler, resulting in very slow root development.

Notes on Varieties.

Georgia.—Did particularly well, outyielding all other varieties. In previous seasons it has proved to be an exceptionally poor yielder, and last season it rotted badly both in field and store. No rotting has taken place this season up till the early part of July. The roots are large, mostly rounded and of good shape; some of the older tubers split badly; smooth clean white skins; appears to be more suitable for stock than as a table variety.

Yellow Strasburg.—Has proved to be a consistently high yielder. The roots were fairly uniform, of medium size, oval to tapering, and slightly corrugated; light yellow skins; when baked, bright yellow flesh, dry, mealy, sweet, and of good flavour.

Brook's Seedling.—Roots mostly rounded to slightly tapering; some good marketable shapes; smooth white skins.

Bon Accord.—Reddish chunky roots, of fair shape, with large deep indentations; yellow flesh.

Brook's Gem.—Tapering roots of medium length; smooth, light brown skins; many under developed roots; might yield well under favourable conditions.

White Yam.—Medium long tapering roots of good thickness; some good shapes; smooth white skins and white flesh.

Nancy Hall.—Roots globular, of fairly uniform shape; good marketable size; slightly corrugated, light yellow skins.

Director.—Medium long tapering roots; many poorly developed roots; smooth light brown skins and white flesh.

Farmer's Special.—Roots mostly long and tapering, with a few rounded roots, and many small ones; smooth white skins and white flesh.

Southern Queen.—Chunky to medium long roots, of poor shape and deeply corrugated; yellow skins and flesh.

Vitamine.—Long tapering roots; a large percentage of small roots; smooth light coloured skins and white flesh.

Porto Rico.—Roots mostly rounded, of medium size; large roots have a tendency to split; smooth salmon coloured skins.

Boyne River.—Roots of medium length and breadth; some good marketable shapes; medium smooth, white skins and white flesh.

Mammoth Cattle.—Mostly rounded to medium long roots; badly shaped and rough; dark yellow skins and yellow flesh.

Triumph.—Poor, thin, long tapering roots, of poor shapes; medium smooth, yellow skins and yellow flesh.

Pierson.—A large number of diseased plants; bunchy top, small stunted plants producing many weak shoots, and no root development; healthy plants with strong vigorous runners, producing medium long smooth roots in large bunches, but of small size.

White Maltese.—Badly diseased, failed to develop roots; similarly affected to Pierson with bunchy top and curly leaf.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize:—	
Fitzroy	L. Waters, Yarramalong.
	F. W. Hill, "Willow Vale," Yarramalong.
	R. W. Hindmarsh, "Wiaraga," Bellingen.
Leaming	Manager, Experiment Farm, Grafton.
Ulmarra Whitecap	R. W. Hindmarsh, "Wiaraga," Bellingen.
Funk's Yellow Dent	N. C. Pyemont, Moondarra, Gundagai.
Broom Millet:—	
White Italian	W. Lye, Loomberah.
Sudan Grass:—	
	Manager, Experiment Farm, Cowra.
Sweet Sorghums:—	
Collier	Manager, Experiment Farm, Grafton.
No. 61	Manager, Experiment Farm, Grafton.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

FIELD DAY AT COMMONWEALTH CITRUS RESEARCH STATION.

IT is proposed to hold a field day at the Commonwealth Citrus Research Station on 29th September, 1926, when an opportunity will be given to those interested in the citrus industry to inspect the work in progress in the laboratory and in the field.

The station, which is jointly financed by the Commonwealth Council of Scientific and Industrial Research and the Water Conservation and Irrigation Commission of New South Wales, was established in 1924 in order to solve some of the many problems pertaining to citrus culture, and already good progress has been made.

Bud-selection, cultivation, fertiliser, and green manuring trials are proceeding, and interesting and valuable results are being obtained, and laboratory work is being done that should prove useful to citrus growers. These and other features will all be explained on the Field Day.

Bunchy Top in Bananas.

The Nature of the Disease and the Measures Recommended for its Control.

[Concluded from page 612.]

Recommendations.

The Investigation Committee made a series of recommendations to the Governments concerned. These have not yet been considered, and their publication should not be regarded as in any way committing the Department to them. These recommendations, which are with a view to restoring the industry in heavily affected areas to its former status, are as follows :—

Recommendations to Growers.

(1) Until such time as it can be declared that any particular district is free from bunchy top, the shifting of suckers in any part of Queensland should be prohibited; after receiving a clean certificate the embargo could be lifted in any such district which would then be protected by the observation of the other recommendations made herewith.

(2) Prohibition of the transportation of any vegetative portions of any banana plant (or any member of the genus *Musa*) from any part of the areas affected with bunchy top to any area not affected with the disease or to any lightly affected area.

(3) Prohibition of the shifting of suckers of banana plants (or any species of the genus *Musa*) from any plantation within a lightly or heavily affected area to any other plantation within that area.

(4) No person should be allowed to trade in suckers or to transport suckers from any plantation in New South Wales or Queensland to any other plantation in either State, unless that, after receipt of a statutory declaration from the person concerned to the effect that bunchy top has never been detected in the plantation from which suckers are to be obtained, a special permit has been granted by a competent official; and, further, no such permit should be granted unless the plantation from which suckers are required, as well as those plantations immediately surrounding it, have been examined by the official not more than fourteen days previously and it has been proved that bunchy top is absent and has never been present in any of all such plantations.

(5) The immediate destruction of all banana plants (or any member of the genus *Musa*) in backyard or similar gardens, that is, in other than registered banana plantations, and the prohibition of the growing of such plants in such gardens.

(6) Registration of all plantations in which any species of the genus *Musa* (bananas, plantain, Manilla hemp) is cultivated, throughout Queensland and New South Wales.

(7) Immediate destruction in any plantation of every stool in which any portion or plant has shown symptoms of the disease, in any lightly affected area; in such cases where the disease becomes very strongly developed, or in lightly affected plantations in specially located areas, which call for special consideration, all plants to be destroyed.

(8) A systematic examination by the grower, at regular intervals, of all stools in a plantation in any lightly affected area or unaffected area.

Young Healthy Plant.
Notice the arrangement of the healthy leaves and the appearance of the unfurled heart leaf.

(9) Bunchy top should be made a notifiable disease in any area not so far known to be affected with the disease, or in any plantation which has been apparently free from the disease as late as the legislative enactment of these recommendations.

(10) Prohibition of the transport of banana fruit from any affected area to the unaffected area north of the affected area, or out of any affected zone in which the disease appears at any time, to any unaffected zone.

(11) Illustrated lectures and practical demonstrations of an educational nature throughout the banana growing areas with a view to enabling

growers to identify the disease at the earliest possible stage; and distribution of a clear, concise and fully illustrated pamphlet indicating the symptoms of the disease, the manner in which it is distributed, and the combative methods recommended.

(12) A systematic inspection of banana plantations throughout Queensland and New South Wales should be undertaken for the purpose of gathering all available information in respect of the condition and history of the plants; and immediate attention should be given to the plantations situated beyond the affected areas, but which have received suckers within the past few years from areas now known to be affected.

Later, the same Plant, as on page 698, showing an Abnormal Bunchy Top and Funnel-like Heart Leaf.

(13) All deserted plantations in existence should be eradicated within a definite period after the legislative enactment of these recommendations.

(14) All affected plantations should be cleaned up within a definite period after the legislative enactment of these recommendations.

(15) Owners should be liable for harbouring affected plants after the expiration of that period.

(16) After a further definite period from the legislative enactment of these recommendations, consideration should be given to the matter of the complete destruction of all banana plants throughout

the affected areas, or in certain plantations bearing unfavourable reports within those areas, and the prohibition of planting-up for an indefinite period in such areas or plantations.

(17) Growers should be dissuaded from planting-up within the known heavily affected areas until such time as an official statement intimates that such procedure offers reasonable chances of success or until such time as the cleaning-up of the affected area has been completed.

(18) Immediate destruction of all affected stools in any plantation in any area from which bunchy top has not been reported prior to the legislative enactment of these recommendations; in such cases

Later Stage in Development of Bunchy Top on the Same Plant as on page 699.
Note the narrowness of the bunchy top leaves, their erectness, and the upward rolling of the margins of the leaf blades.

where the disease becomes very strongly developed, or in lightly affected plantations in specially located areas, which call for special consideration, all plants to be destroyed.

(19) It should be made compulsory on the part of the owners to complete the destruction of all banana plants on land which has passed out of systematic cultivation, and so prevent the persistence of deserted plantations.

(20) A Government Nursery should be set up in some part of Queensland that is free from bunchy top and beetle borer, for the supply of reliably healthy suckers at a reasonable price.

(21) A most serious effort should be made by the Governments and growers concerned in the efficient discharge of these recommendations with a view to hastening the eradication of the disease and thereby restoring the industry to its former status as quickly as possible and preventing the spread of the disease. With this object, the following suggestions are submitted for consideration :—

(a) Where the necessary powers are not available under present enactments, the Governments concerned should legislate as quickly as possible, and it is desirable that such legislation should, as far as practicable, be on the same basis in Queensland and New South Wales.

The same Plant Four Months after the Development of the First Symptoms of the Disease. Note the typical "rosetting" of the bunchy top leaves.

(b) The necessary machinery should be devised by the Governments of New South Wales and Queensland for giving effect to the regulations, controlling the problem of eradication, and intensifying the educational aspects.

(c) Provision should be made for an adequate staff of competent inspectors who should be provided with motor transport facilities.

(d) As the further investigation of certain aspects of the bunchy top problem is contemplated, the results of which will be submitted to the Bunchy Top Control Board from time to time in reports from the Supervisor it is desirable that there should be the fullest co-operation between that body and the State Departments concerned.

(*e*) A definite effort should be made to enlist the co-operation of the various societies or associations, &c., interested in banana growing.

(*f*) Consideration should be given by the Governments concerned to the means of dealing with the difficult problem of heavily affected or deserted plantations, such as making provision for funds for eradication by means of a monetary advance against the land, to be redeemed within a certain number of years, or by means of a levy on the industry—on an acreage or production basis—assisted or unassisted by a Government contribution, &c.

Some Facts about Bunchy Top.

(1) Bunchy top in bananas is a disease due to the presence in diseased plants of a germ (so minute that it cannot be seen with the eye under the highest powers of the microscope).

(2) Once the disease has made its appearance in any banana plant nothing on earth can remove that disease or cause the plant to recover.

(3) Once the disease has made its appearance in any banana plant, in nearly every case all plants or suckers in that stool will develop the disease.

(4) The disease can be carried from any diseased plant in a plantation to other plants in that or neighbouring plantations, by means of the dark banana aphis, which occurs wherever the banana plant is grown.

(5) The banana aphis does not cause the disease, but serves to carry the disease from one plant to another, in much the same way as a certain kind of mosquito transmits malaria from one human individual to another.

(6) The disease takes, generally, about a month to appear after aphides from a diseased plant have been placed on a healthy plant.

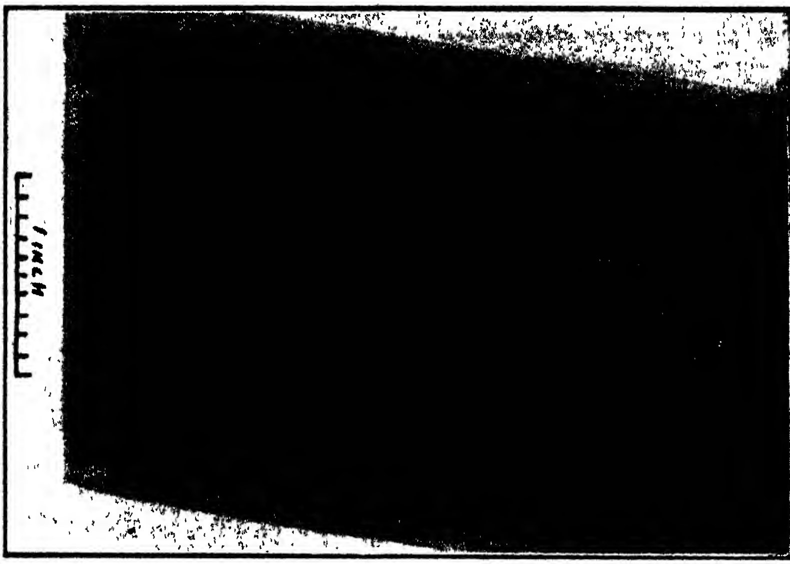
(7) Consequently you cannot trust any sucker which has been obtained from a plantation in which bunchy top is present, or any plantation which is close to a plantation in which bunchy top is or has been present, since the plant may be at the stage in which the disease is present but sufficient time has not elapsed to enable the symptoms to appear.

(8) The shifting of suckers out of any plantation affected with bunchy top is, in practice, sure to start the disease in any plantation to which such suckers are taken. Aphides will then serve to carry the disease to other plants in that and neighbouring plantations. In time, unless the following recommendations are carried out to the last letter, the disease will ruin the plantation and even the area in which your plantation is situated.

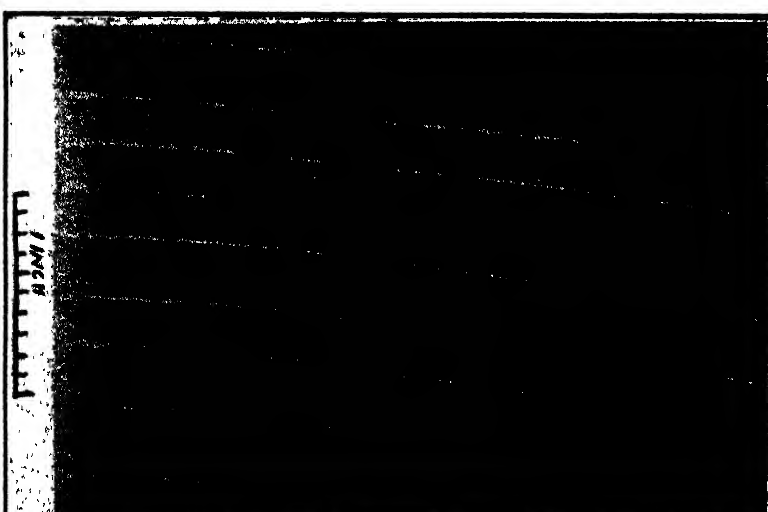
How to Tell Bunchy Top.

(1) Inspect carefully each plant, young and old, in each stool in your plantation at regular intervals.

(2) Examine the youngest leaf in each plant in each stool by holding the leaf in such a way that you can see through it from the back of the leaf.



Portion of the leaf blade of a Bunchy Top leaf, viewed from the underside, showing advanced stage of the dark green streaking. The appearance of streaks of this nature, perhaps only four or five in number in the first instance, between the veins of the leaf blade is the first symptom of the disease.



Portion of the Leaf Blade of a Healthy Leaf viewed from the Underside.

(3) If the leaf is diseased there will be seen broken greenish streaks between the veins, that is to say, lines broken into longer and shorter portions, or having the appearance of the Morse code signs. These will first be seen at the lower end of the leaf, but when the eye is used to it they will be seen throughout the leaf. (*See* accompanying illustrations.) This is the first symptom of the disease.

(4) Sooner or later dark streaks will appear in the stalk of the leaf and in the midrib.

(5) If the original plant has been born with the disease, that is to say, has been taken from a diseased corm or bulb, every leaf will show these streaks.

(6) If the plant was originally healthy, but has contracted the disease as the result of the germ being carried to it by aphides, then only leaves developed some time after the infection will show the disease. Hence, the safe procedure in all cases is to examine the last leaf, and then you will not miss the disease.

(7) In plants born with the disease, all the leaves will from the beginning be narrow, short-stalked, brittle, with curled margin, and stand erect, thus giving the typical bunchy-top appearance, and will, in addition, show plainly the typical green streaking.

(8) In plants which were originally healthy but have contracted the disease, this narrowing of the leaf, short-stalked condition, brittleness, and bunched appearance, &c., will only be seen in leaves which develop several weeks later than the first appearance of the green streaks.

(9) If you are careless and do not detect the trouble until plants have got to that stage, you have been giving aphides plenty of time to transmit the disease to other plants.

What to Do.

(1) Carry out at least a weekly examination of each plant in each stool, paying careful attention to the last leaf in each plant, and observing whether there is any trace of the characteristic broken dark green streaks in the leaf blade. A definite day at least each week should be set aside for this purpose, if at all possible.

(2) Do not plant out more suckers than can be satisfactorily dealt with in such a weekly inspection.

(3) Deal at once with any affected stool as follows:—

(*a*) Spray the whole stool thoroughly, as well as the surrounding soil, with Black Leaf 40 (two egg-cups of solution to a kerosene tin of water), in order to kill any aphides present, and so stop them when disturbed from spreading to other stools.

(*b*) Dig out the stool complete, even if only part is affected, and cut all parts of the plants into slices with a cane knife, or suitable implement. There is no necessity, nor is it advisable, to carry away such material, which can be left to die on the plantation. A very conscientious grower might well give an additional spraying to the cut-up material, and might see that the material is burnt if possible.

(4) Remember that if any one plant in a stool is diseased, the whole stool must be regarded as diseased. Otherwise you will find you are wasting your time by only removing those plants which are diseased in a stool. Remove the whole stool.

(5) Success in fighting the disease lies in the earliest detection of diseased stools and their immediate destruction.

(6) Growers should encourage their neighbours to follow the above procedure as diligently as themselves, since without such help every assistance is being rendered towards gradually transforming areas now lighly affected into heavily affected areas.

[The accompanying illustrations have already been published in the Queensland *Agricultural Journal.*]

Tubercle-free Herds.

The following herds of cattle have been submitted to the tuberculin test by Government Veterinary Officers or approved veterinary surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd:—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
Department of Education ..	Eastwood Home ...	......	10	7 Oct., 1926.
Do do ...	Hurlstone Agricultural High School.	......	47	23 Nov., 1926.
Do do ...	May Villa Homes ...	......	6	8 Jan., 1927.
Do do ...	Yanco Agricultural High School.	......	29	14 Jan., 1927.
Walter Burke	Bellefaire Stud Farm, Appin.	Jersey..	36	19 March, 1927.
Department of Education ...	Gosford Farm Home	......	32	16 April, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
William Thompson Masonic Schools.	Baulkham Hills ...	......	33	15 June, 1927.
Department of Education ...	Mittagong Farm Homes.	......	33	7 July, 1927.

—Max Henry, Chief Veterinary Surgeon.

Poultry Notes.

SEPTEMBER.

JAMES HADLINGTON, Poultry Expert.

HATCHING operations should be brought to a conclusion this month, which means that no eggs should be put down for incubation after about the 9th. If this rule were more rigidly observed many disappointments in rearing would be avoided. It is quite understood that here and there better results are secured perhaps than is generally expected with chickens hatched after September, but these are the exception, and not to be expected.

Whatever odd experiences are met with in this connection, it is a bad practice for the commercial poultry farmer to attempt late hatching; yet every year one sees thousands of chickens hatched in October and even later, which never are profitable to the farmer. The exceptions to this rule, where they do occur, are mostly where some specially favourable condition is present, such as new ground that has not been previously used for chickens.

This warning is perhaps even more necessary in the current hatching season than when conditions are more normal, owing to the fact that, if happily there should be a favourable turn in respect of the price of foodstuffs, there might be a fairly general attempt to make up leeway in respect of the falling off in the number of chickens so far hatched this season. It will, however, be a mistake to make any such attempt. The writer is not particularly keen about advocating summer or autumn hatching, except under special conditions, but should the cost of feeding come down a considerable extent it would be much better to make a small hatching during February and March than to prolong the spring hatching beyond the end of this month.

The outlook for the commercial poultry farmer is at present anything but promising, and many will have a big struggle to get through without running undue risk with unprofitable flocks; but to those who can weather the adverse conditions prevailing, I would say, "stick to your farms." Such conditions have prevailed before and will come again, but in the interim there is generally a better time.

High Cost of Feeding.

Much attention is now concentrated upon the problem of high cost of poultry foodstuffs, and it is realised that the present position of the poultry industry is rather discouraging, but it will be odd indeed if relief is not presently afforded in some way or other. In the meantime economy should be the slogan. Cut out unprofitable units in the flock, carry no more cockerels than is absolutely necessary, closely scan every item of food purchased, do not be led away by some much-boomed "make the hens lay" stuff, but rather rely upon your own skill and judgment, and feed simple rations

such as are laid down in " Rearing and Feeding," or in " Poultry Farming in New South Wales," using the substitutes (if they are cheaper) that are mentioned in the latter publication.

Particular attention should be paid to the possibilities of lucerne, though it must be remarked that many farmers are already using too much succulent lucerne in the morning mash. That practice can only result in partial starvation of the birds, and consequent loss of production. Particularly will this be felt about October and November on the turn from the peak of production and onwards. It has already been emphasised in these notes that poultry are not equipped with the capacity for dealing with bulky materials in quantity sufficient to allow of adequate nutriment for them.

It has previously been shown that as much as 20 per cent. of the mash might be lucerne. It can be fed in the form of chaff, meal, or dust. The last is a product from under the chaffcutting machines, while lucerne meal is specially ground from baled dry lucerne, but it is for the most part too high in price.

Dry Lucerne—A Suggestion.

Lucerne chaff of prime quality and fine cut is quite all right to incorporate in the mash, having much the same food value as bran. Unfortunately, good lucerne is generally high in price when other foods are scarce, and the moral lies just here—that poultry farmers should grow more of it, and instead of feeding too much in the green succulent state should make a portion into lucerne hay and then cut it into chaff, in which form it can take the place of 20 per cent. of the mash. As a matter of fact, 20 per cent. of dry lucerne in a ration would contain rather more food value than 60 per cent. of green lucerne. This, too, would allow of the usual quantity of succulent green feed being supplied in addition at other times of the day.

It should be realised that many make the high cost of feeding still higher by what might be termed fads in feeding.

It would be well for every farmer to keep a check on the cost of feeding as against egg production, taking into account the seasonal expectations of laying month by month. For this purpose take the average daily consumption of food by the laying stock (leaving out all other classes) and then compare the average daily or weekly tally of eggs collected with the average expectation for the particular month under review. Thus, on a farm carrying equal numbers of first and second year hens (what many term pullets and hens), the expectation for September on the basis of 12 dozen per hen for the year, would be 19 eggs, or a daily gathering of nearly two-thirds as many eggs as there are hens in the flock of layers. If this result is not being obtained, there is something lacking. As a matter of fact, the table of "expected laying" is made up on the basis of the minimum laying on which a farm can be made to pay, so that the actual laying should slightly exceed the expectation.

The table referred to has previously been published in these notes, but a reminder will perhaps be of service. Taking a flock composed of equal numbers of first and second year hens, the following is the monthly expectation of laying on a 12-dozen basis of production:—

May	4 eggs per hen.	November	17 eggs per hen.
June	6 " "	December	16 " "
July	10 " "	January	13 " "
August	16 " "	February	11 " "
September	19 " "	March	7 " "
October	19 " "	April	6 " "

Packing Eggs for Export.

From time to time instructions have been issued as to how eggs should be packed for export, and to the credit of many consignors it can be said that such instructions have been carried out admirably, but there are still very many consignors whose packing and grading leaves much to be desired. Perhaps the reason for this is the fact that they have not suffered reductions for breaches of the instructions in this connection. However, the time has arrived when, if a 1s. 6d. market is to be maintained in the flush season of production, more attention must be paid to the quality of the pack.

As the certifying officer for practically all export eggs, the writer can speak with definite knowledge on this subject, and it really is surprising how carelessly some of the packing is done. In this connection it should be understood that it is not merely that a number of eggs must be rejected in the re-packing of eggs intended for export, but that almost every egg must be scrutinised by "candling" and otherwise, to ascertain its quality from many points of view, before it can safely be put into the case. Much of the work and vigilance entailed in re-packing (all of which has to be paid for) could be obviated on the farm with but little extra care on the part of the consignor, and with practically no loss of value in most cases. It is only a question of putting eggs in their right grade or denomination. For instance, eggs that have been washed lose in keeping quality, and are rejected for export. No deductions as to price, however, are made on this account, because they go into local consumption. The same thing applies to eggs the shells of which are somewhat misshapen, thin, or porous. Dirty eggs are excluded from export, and are not fit for first grade local.

The following are the points that should be observed in despatching eggs:—

1. They should be graded into three sizes, first grade containing no eggs less than 1¾ ounces, but the whole averaging 2 ounces.
2. Second grade below 1¾ to 1½ ounces.
3. Third grade 1½ ounces and below, known as pullets' eggs.
4. Both the P.D.S. and the P.F.A. require a certain proportion (according to instructions) of special eggs packed for export.

With regard to the last point, it is important that very special care be exercised in respect of quality. These cases should not contain eggs with any of the following faults:—(*a*) Porous or misshapen or thin shells; (*b*) dirty eggs; (*c*) eggs should not be more than four days old, preferably they should be infertile, and they should be kept in a cool place; (*d*) in the

case of the P.F.A. no eggs for export should be less than 1⅞ ounce in weight. A strict observance of these simple rules will eliminate much of the labour and supervision involved in re-packing. Slipshod methods, such as lead to the inclusion of unsuitable eggs, largely increases the cost of re-packing and grading for export, and in the end such increased cost has, of course, to be borne by the poultry farmer in one way or another. Therefore it is to the farmer's interest to adopt approved methods.

How the Poultry Farmer can Help.

Suitable cases should be used in which to despatch the eggs. The standard sizes in use are 15, 18, 30, and 36-dozen capacity. Sometimes kerosene cases are used, but their use should be discouraged. As a matter of fact, it would be in the interests of all concerned if farmers would further narrow down these sizes of the cases in use to the standard 15 and 30-dozen capacity. These two cases would meet all requirements on the farm or in the trade, and the 30-dozen case would be in conformity with the standard export case.

The next consideration is suitable fillers and flats. It is false economy to use these when they are too much worn or damaged. Moreover, eggs are often broken owing to the way in which they are packed in the fillers. For instance, many eggs are found to be broken because they project above the fillers, while others are broken by pressure on the sides, due to large eggs being wedged into cells adjacent to one another. A proper distribution of large eggs round the sides and in the corners of the fillers would very largely overcome this trouble. The same applies to long eggs, which in the ordinary way would project above the filler; these, if leaned over in the cells, would escape being cracked.

Another and most prolific cause of cracked eggs is the way in which the cases are filled. The following order of packing should be observed:—

1. Sound cases, fillers, and flats only should be used.
2. Starting from the bottom, the first thing put in should be a cushion of crumpled paper—not merely so many thicknesses of paper—or, better still, wood-wool spread out to form an even pad, and not too thick, or the eggs will be too high in the case when it is full; then place the first flat in position followed by a filler, and so on until the top is reached, on which another pad of crumpled paper is placed.
3. During the placing of the fillers and flats (together with the eggs) in position, any large cavity between the sides of the case and the layers of fillers containing the eggs should be stuffed with small pads of paper or wood-wool, but the tiers should not be packed too solid, because in that case any undue pressure on the sides or lids will cause breakages.
4. To be regarded as first grade, eggs should be marketed twice each week, so that no egg is more than four days old when packed.
5. During the export season all washed eggs should be kept separate, and only packed among eggs intended for local consumption.

Close attention to these details will do much to improve the quality, and prevent disappointment to all concerned.

Orchard Notes.

SEPTEMBER.

W. J. ALLEN and W. LE GAY BRERETON.

THE beginning of the spring means the start of the busy spraying season for the apple, pear, peach, and vine growers.

Codling Moth.

The severity of the initial infestation of this pest each season depends entirely on the survival of the carry-over grubs from the previous season. The infestation last season was generally very severe, but without any human interference it would be quite possible for the infestation to be far less this year. The mortality among the carry-over grubs from natural causes may be high and may account for a light emergence of moth this spring.

Judging from past experience, however, natural mortality is never sufficient to reduce the infestation to practically harmless proportions, and, though it is quite possible for the infestation to be far less severe than last year, we can rest assured it will be bad enough to cause considerable loss unless every effort is put forth to check it.

The fact that the sole source of each year's trouble is the grubs (larvae) which survive from the previous season cannot be reiterated too often. It is estimated that the female moth may lay sixty eggs, so that every carry-over grub that is killed is of considerable consequence. Methods of dealing with the carry-over grub were given in previous notes, and it is certainly wise to have had the work carried out before this, but if it has not yet been done it should be completed as soon as possible. Even if, for any reason, the work has been delayed till after the moth has started to emerge, it is still worth pushing through to completion, because the grubs do not all emerge at once, some waiting till late in the season.

If not already done, therefore, examine bandages, crevices, rolls of bark, and any loose bark on the trees; a favourite place is the crown of the tree where the main limbs junction with the trunk. Be sure to kill all the grubs—careless work is time thrown away. Some growers, besides using the usual bandage round the trunk, place a crumpled piece of paper in the crown of the tree, and before time for the emergence of the grubs carry a fire-can round and burn the papers. This is a good practice, but it must not be overlooked that grubs will also often be found in the rolls of bark that occur where the limbs junction and among the old leaves and other rubbish that accumulate in the crown. Even if the bandages have been examined during the winter, it is wise to examine them again before the time for emergence of the grub in the spring, for frequently the grubs move to them from less secure hiding-places.

Preparations to clean up old packing or other sheds that have held apples, pears, or quinces should now be completed. The date at which such sheds should be closed will vary in different districts, but it is wise to be on the early side, because the time of first emergence varies from season to season. Even though the shed is to be closed, a thorough search should be made and any grubs that are found within killed, because the delayed emergence of many grubs may be prolonged till the fruit season, when it is necessary to have the sheds open again.

All cases which have held infested fruit the previous season should be dipped under boiling water for not less than three minutes, whether they are to be stacked in the closed sheds or not.

If the trees have not been previously bandaged preparations should be made to carry out this work. The thicker grain bags make a darker hiding place, and are superior to chaff bags for the purpose. The bags should be cut into strips about 6 inches wide. Any stitching holding down old hems should be pulled out, as the grubs will often hide under these hems and the stitching prevents quick examination. About 2 inches along one edge of the strip is folded in; this folded material comes in contact with the trunk of the tree, while the longer edge on the outside hangs looser, inviting the grub to come under its shelter.

The method of attaching the bandage by driving a fine diamond-headed nail into the trunk of the tree, allowing it to project about three-quarters of an inch, appears to be the handiest. One end of the bandage is hooked on to the nail, the bandage is brought round the tree, and the other end fastened by hooking it over the same nail. One end should overlap the other by 2 or 3 inches.

Lead Arsenate Spray.

Some of the coastal apples and pears blossom early and may be ready for the first or calyx spray of lead arsenate this month, but most apples and pears in the inland and tableland districts are not ready till well into October. The timing of this first or calyx spray should be done by watching the calyxes of the fruit, and as soon as the earliest of these shows signs of closing the application should be made. It should be of a drenching nature, so that the calyx cups may be well filled. A second application should be made about a week later to catch those fruits whose calyxes are later in closing. A double application of this sort makes the job a thorough one.

It is contended by some that because the heaviest emergence occurs far later than at the completion of blossoming the calyx application is not required, but the evidence indicates that the omission of this first spraying is unwise. When the tiny grub hatches from the egg it looks for a place where it can get a purchase to start boring, and even if the calyx be closed it offers a very suitable place. Many years ago, before spraying apples and pears with arsenical mixtures was practised, entry through the calyx by the grubs was extremely common, but since the use of arsenical sprays entry by that means is comparatively rare. Within quite recent years it has

been observed in places where, for some reason, the calyx application has been missed, that the percentage of calyx entries has been far higher than where the calyx application has been carried out.

The foregoing is the plan of campaign by which the initial infestation may be reduced. It aims at killing off, as far as possible, the source of the trouble—the carry-over grub—and at laying poison for the offspring of those carry-over grubs that escape.

Unfortunately all the carry-over grubs that survive do not develop into moths at one period: many hang fire till late in the season, so that the grower has these to contend with in the latter part of the season as well as the second generation from those moths that emerged earlier. That phase of the campaign will be dealt with in notes appearing later.

Black Spot of Apple and Pear.

In districts where apples and pears are liable to attacks of black spot the first application of the fungicide lime-sulphur at spur-burst strength, or of Bordeaux mixture at 6-4-40, should be made when the spurs are opening and just showing the clusters of blossom buds within. This is the early spur-bursting stage.

If lime-sulphur is the fungicide used for control of black spot of apple or pear, the early spur-burst application should be followed by a second application at spur-burst strength at the pinking stage, *i.e.*, when the sepals of the blossom buds have slightly expanded and are just showing the colour of the still closed petals beneath.

In experiments carried out at Batlow last season by Mr. H. Broadfoot, of the Fruit Branch, in conjunction with the Biological Branch, lime-sulphur at full winter strength at the early spur-burst stage gave better results than when the spur-burst strength was used at this stage. In repeated experiments at the experiment farm orchards at Bathurst and Glen Innes winter-strength lime-sulphur caused no damage when applied at the spur-burst stage.

Bordeaux mixture is undoubtedly a more efficient fungicide against black spot of apple and pear than lime-sulphur, but unfortunately if the weather is foggy or wet and it is applied later than the early spur-burst period and up to six weeks or so after setting it is very liable to damage the fruit by russeting. It should be observed that there are many parts of this State where black spot of apple and pear does not occur, or occurs so rarely or in such a mild form that it is unnecessary to spray for the disease.

Leaflets on black spot of apple and pear, and on the making and diluting of lime-sulphur to the various strengths, also on the making of Bordeaux mixtures, are obtainable free from the Department.

Black Peach Aphis.

A careful watch should be kept on peach trees, and they should be sprayed with nicotine sulphate, 40 per cent., diluted 1 to 800 by volume (1 pint to 100 gallons water), or with tobacco wash as soon as the pest

appears. The spray should be applied at high pressure and the nozzle held close to all affected parts to break up the clusters of the insects; if within two days, or at outside three days, after the first application any live aphis remain, the treatment should be repeated. This insect breeds very rapidly, and it is only by repeated applications at intervals of two to three days that it can be got under.

Green Peach Aphis and Black Cherry Aphis.

As mentioned in earlier notes, these pests must be dealt with by an oil spray before the trees start in the spring. If this has been neglected and green aphis appear, use the same treatment as for black peach aphis to stop their increase as far as possible.

If the attack of black cherry aphis is only slight, it is worth cutting off and burning the first few early affected twigs.

Black Spot of Grape.

If the spring is favourable there will be an outbreak of this disease, and it is never wise to risk omitting the initial treatment. Where swabbing with sulphuric acid, or sulphuric acid and sulphate of iron, has not been carried out for any reason, the vines should be sprayed with Bordeaux mixture, 6-4-40, when the buds are swollen. Tests carried out by Mr. Cook at Yanco Experiment Farm have given very good results from the early application in place of the swabbing, and though perhaps it would not be wise to substitute this for swabbing until the tests have been carried on for a greater number of seasons, we can recommend its use when swabbing has been omitted.

The later applications of Bordeaux at 6-4-50 should be made when the vines have shot and again before blossoming. It is often during blossoming that spot does the greatest damage, and though spraying during blossoming must be avoided if possible, in seasons when weather conditions at that stage are in favour of spot it is better to risk damage by spraying than the certain damage from spot.

Downy Mildew and Oidium.

The spraying with Bordeaux mixture for spot will also protect the vines from mildew, but it must be remembered that downy mildew is liable to occur at a later stage than spot; hence spraying with Bordeaux mixture must be continued until well into the summer.

As a preventive of oidium the vines should be dusted with sulphur from the time the shoots are 2 or 3 inches long.

Leaflets on the above diseases of the grape vine are obtainable on application to the Under Secretary, Department of Agriculture, Sydney.

Cultivation.

Previously ploughed land should now be worked up into finer condition. Where green crops have been ploughed under and have not thoroughly rotted away it is often necessary to use disc implements, as it is very

difficult to get tine implements through. The trouble with disc implements is that they make the surface too fine, and tine implements should therefore be used as soon as practicable. In some cases where ploughing was carried out early the soil may have become compacted again, and it may be necessary to plough a second time.

Do not forget that the mouldboard plough is the best cultivator, forming a mulch that is more thorough and lasting, and that will let in rain more easily than either tine or disc cultivator. The cultivator is often a useful substitute because it will complete the work more quickly.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society and Secretary.	Date.		Society and Secretary.	Date	
Ganmain (C. C. Henderson)	Sept.	14, 15	Hillston (J. Pevers) .. .	Oct	1
West Wyalong (T. A. Smith) .	,,	14, 15	Corowa (J. D. Fraser) ..	,,	1, 2
Cowra (E. Todhunter) ..	,,	14, 15	Cudal (H. W. Ford) . ..	,,	5, 6
Manildra (J. Longley)	,,	14, 15	Ardlethan (R. L. Neill)	,,	6
Singleton (S. Griffiths)	,,	15 to 18	Quandialla (V. G. Talbot).. ..	,,	6
Melbourne	,,	16 to 25	Hay (R. Eager)	,,	6, 7
Lockhart (E. D. Arnold) .. .	,,	21, 22	Narrandera (W. H. Canton)	,,	12, 13
Murrumburrah (W. Worner) ..	,,	21, 22	Ariah Park (J. McInness) ..	,,	13
Canowindra (J. Rhue)	,,	21, 22	Carcoar (J. Brady)	,,	13
Temora (A. D. Ness)	,,	21, 22, 23	Millthorpe (T. P. Smith) .. .	,,	19, 20
Boorowa (W. Thompson).. ..	,,	22, 23	Griffith (M. E. Sellin) .. .	,,	19, 20
Bega ( )	,,	25	Deniliquin (P. Fagan) . .	,,	19, 20
Henty (J. Lovell)	,,	28, 29	Lismore (H. Pritchard)	Nov.	16, 17, 18
Barellan (J. Doherty) .. .	,,	29	Murwillumbah (T. M. Kennedy)	,,	24, 25
Barmedman (W. Pemberthy) .	,,	29	Coramba (H. E. Hindmarsh) ..	,,	30, Dec. 1
Eugowra (F. E. Hill)	,,	29			

1927.

Dapto (E. G. Coghlan)	Jan.	14, 15	West Maitland (M. A. Brown) ..	March	2 to 5
Kiama (G. A. Somerville) ..	,,	25, 26	Moss Vale (W. Holt)	,,	3, 4, 5
Wollongong (W. J. Cochrane) .	,,	27, 28, 29	Glen Innes (G. A. Priest).. ..	,,	8, 9, 10
Tahmoor (E. S. Key)	Feb.	11, 12	Bangalow (W. H. Reading) ..	,,	9, 10
Newcastle (E. J. Dann)	,,	15 to 19	Taree (R. Plummer) .. .	,,	9, 10, 11
Pambula (L. K. Longhurst) .	,,	16, 17	Campbelltown (W. N. Rudd) ..	,,	25, 26
Rydal (H. Murray)..	,,	19, 20	Molong (W. P. Stanger)	,,	29, 30
Gunning (G. E. Ardill)	,,	22, 23	Camden (G. V. Sidman)	,,	31, Apl. 1, 2
Blacktown (J. McMurtrie) ..	,,	25, 26	Sydney Royal (G. C. Somerville)	April	11 to 20
Bega ( ) .. .	March	2, 3	Grafton (L. C. Lawson)	May	4, 5, 6, 7

"The Principles and Practice of Horticulture."

The title of this excellent little manual is perhaps pretentious, as the author (A. S. Galt, of Leeds University) is fain to admit, but its intention being to marshal scientific principles, together with the salient facts of the cultivation of fruit and vegetables, no other would quite serve.

The book presents a simple yet reliable statement regarding the principles governing fertility, first giving an account of the formation of soils, and describing their great variety. Manuring and cultivation are each discussed usefully, and something over one-half of the book is then devoted to production of specific vegetable and fruit crops under English conditions.

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Agricultural Gazette of New South Wales.

Wheat-growing in the South-west and Riverina.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

DURING recent years the agricultural methods adopted in the Riverina and South-western Slopes have been passing through a period of change. Farmers are realising the advantage of up-to-date practices, and many are making vigorous efforts to increase their average yields. Even the smaller details are now receiving close attention and new ideas are eagerly received.

This advance in the methods adopted has resulted in increased yields in the older localities, and has also made possible the production of payable crops in portions of the district previously considered too dry to successfully grow wheat. The increased attention devoted to the fallows, selection of suitable varieties, recognition of the importance of pure seed, and the increased use of superphosphate are some of the factors contributing to increased yields. The results of farmers' experiment plots distributed throughout the district have afforded valuable information, particularly on such matters as varieties and fertilisers, while the numerous crop and fallow competitions have afforded an excellent opportunity for the collection and dissemination of valuable data related to every detail of wheat-growing. Knowledge of wheat-growing in New South Wales will steadily increase, and it is therefore to be expected that the methods at present regarded as up-to-date will in the future be constantly improved upon.

It is intended in this article to pay most attention to recent developments in practical wheat-growing, not with the idea of laying down definite rules to be strictly adhered to, but in the hope that the proved methods discussed and explained herein will be a useful guide to wheat-growers, particularly throughout the southern part of the State.

Soils.

In the district under review many different soil types, of course, occur. A large portion of the district is pine country. Here the soil is usually red in colour, light in texture, fairly deep, and easily worked. Country carrying grey or white box and pine is very popular among wheat-growers. The soils are usually deep red, moderately heavy to light loams, the subsoil frequently being heavier than where pine only is found. Large areas of land carrying only white and yellow box occur, more particularly in the localities favoured by a fairly heavy and reliable rainfall. The soils vary from very light brown to deep red in colour, and from light to fairly heavy deep loams. Soils carrying only white box are admirably suited to wheat-growing.

Country on which buloke and belar are found is generally heavy in character and brownish-red to chocolate in colour. It is generally excellent wheat land, although heavier to work than the box or pine country. Occasionally, however, buloke is found also on medium to light country. Peculiar depressions, commonly called "crabholes," sometimes occur in country carrying belar, and the land is frequently exceptionally heavy. Areas of "crabholey" country carrying boree timber are to be found scattered throughout the district. The soils are usually heavy, and vary in colour from grey to black. It is exceptionally good grazing country, and, in addition, when cultivated correctly it is capable of producing excellent wheat crops.

Stretches of mallee also occur throughout the western part of the district. The soils vary from light-sandy to heavy-clay loams. It is only during recent years that much attention has been paid to the mallee in New South Wales, but a very promising measure of success has already been obtained, particularly where the soil is not too light in character.

Wheat is also grown on some of the plain country where no timber naturally occurs. These soils are generally medium to heavy clays, and they are rather heavy to work. They occur chiefly in the south-western portion of the Riverina.

METHODS OF CULTIVATION.

Farming Machinery.

Great improvement has recently been effected in farm machinery. These improvements have generally been the result of Australian inventions. It is largely by reason of the up-to-date implements used that Australia can continue to profitably extend her wheat-growing operations. Combine drills, by enabling seeding operations to be carried out so much quicker, have relieved much of the anxiety associated with the sowing period. Rigid tine scarifiers, on which different sized points can be used, have resulted in improved fallows.

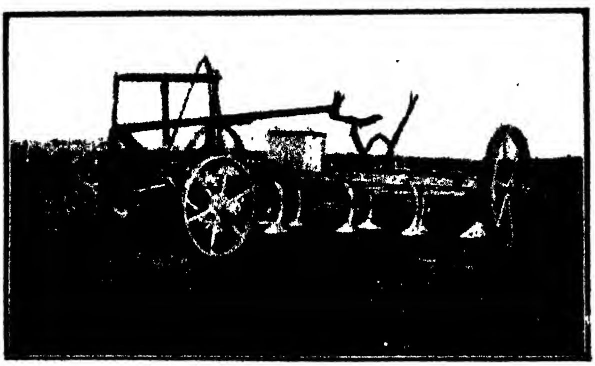
Then the introduction of the modern reaper-thresher with crop-lifting attachments has greatly lessened the risk at harvest time. Harvesting is not only expedited, but lodged crops can now be successfully harvested. During the last few seasons, crops that were lodged and tangled by wind and rain to such an extent that in the past they would have been abandoned, have, by the use of the improved harvesting machinery, been successfully gathered.

Ploughs.—The mouldboard plough is generally favoured in the Riverina and South-western Slopes; in fact, very few disc ploughs are to be found throughout this large wheat-growing district. The mouldboard does neater work and inverts the furrow slice more thoroughly, but it does not pulverise the soil to the same extent as the disc. After being ploughed with a disc many soils become rather fine, which makes it difficult to maintain the necessary cloddy surface on the fallow. When a disc plough is used, the subsequent cultivation is not quite so heavy, but the fallow will not usually be found to be in such good condition as when fallowed with a

mouldboard plough. It has been found that on some of the heavy clay soils the disc performs the work at a lower cost, but for the majority of Riverina and south-western soils the mouldboard should be used in preference to the disc.

Springtooth cultivators are useful on most classes of soil, but are more effective on the light to medium loams. They are excellent implements for the first cultivation after ploughing to bring the clods to the surface, also for stirring the surface to maintain a cloddy mulch, but unfortunately they are not effective in destroying weeds, except while the latter are very young. They also possess the disadvantage of cultivating too deeply where the soil is loose and friable, while, on the other hand, where it is hard and set, these implements, lacking rigidity, cannot penetrate sufficiently deep.

Rigid tine scarifiers.—These are very effective implements on most classes of country. Being rigid, the tines can be set to the desired depth, and very uniform work will result. Different sized points are available, so that



Rigid Tine Scarifier.
A very popular implement for working the fallow.

towards the end of the fallowing period, as weeds get larger, the wide points can be used. The notched points are more effective for weed destruction than the plain ones. Knife bars can also be attached for cutting large weeds; in fact, they are frequently necessary to avoid hand-hoeing. Even when the 12-inch points are used on the rigid tine scarifier, large black thistles and paddymelons cannot always be effectively dealt with, the thistles sliding round even the widest points, and so escaping destruction. Instead of cultivating the fallows too deeply in a vain endeavour to kill all black thistles and melons, it is advisable on country free from roots and stumps to attach knife bars to the scarifier. If these are correctly adjusted they will effectively deal with black thistles, paddymelons, and other weeds growing on the fallow, and without going deeper than 2 inches. Some home-made knife bars have been observed, and, although these were only made from old "choke-cutter" knives, the "duck feet" points being removed to allow the knife to be attached in their place, very effective work was nevertheless performed. With properly-constructed steel knives

attached diagonally to the scarifier, even full-grown black thistles can be destroyed. When the knife bars are adjusted to a uniform depth, say, of 2 inches, the effect is very beneficial to the fallow. The evenness of the depth of the mulch and the consolidation of the subsurface are improved.

The rigid tine scarifier is a handy implement for cultivating stubble land in late summer or autumn or for summer fallowing. Being heavier and more rigid than the springtooth cultivator, it is a better implement for such work. The stump-jump scarifier is slightly heavier, and should be used on mallee country or where roots and stumps occur.

Harrows are now being used to a greater extent than formerly. Where paddymelons are troublesome a knife bar may be attached to a set of rigid harrows. The knife is kept reasonably sharp, and is fastened diagonally. In some classes of soil this will successfully deal with paddymelons, provided it is carefully adjusted, and the paddymelons are not too large. Where the melons are too thick the scarifier with knife bar attached must be used.

The advantage of using the harrows with the knife bar attached is that a much greater area can be handled. With a large set of harrows from 60 to 100 acres may be covered in a day. This is not only cheaper than using the cultivator, but it also enables the work to be completed in one-quarter the time—a wonderful advantage during the summer when the land dries out rapidly and weeds grow so quickly.

Disc cultivators are useful on certain heavy clay soils for breaking up large obstinate clods. They are also a good implement for summer-fallowing stubble land, particularly if it is to be followed by a ploughing in the winter. These are the chief instances where the use of the disc cultivator is favoured. They are certainly effective in destroying weeds, but have the disadvantage of throwing the fallow out of condition. Instead of leaving fine soil underneath and clods on the surface, the disc places the fine soil on the surface and buries the clods. Should rain fall on this fine surface, another cultivation will be necessary to prevent the formation of a surface crust. On most classes of land the use of the disc is to be condemned.

There is too great a tendency to neglect the fallows until the weeds get so out of hand that the land must be disced deeply to destroy them. This deep discing completely disarranges the fallow and would not have been necessary had a more suitable implement been used earlier. Now that attention is being paid by practical farmers to the actual physical condition of the fallow as well as to the destruction of weeds, the disadvantages of the disc are being realised, and it is rapidly going out of favour.

The summers of 1922-23 and 1923-24 were very moist and weed growth on the fallows was exceptional. In spite of this, however, numerous fallows were to be found that had been kept quite free from weeds without the use of the disc cultivator. Sheep and the springtooth and rigid tine scarifiers were the agents responsible.

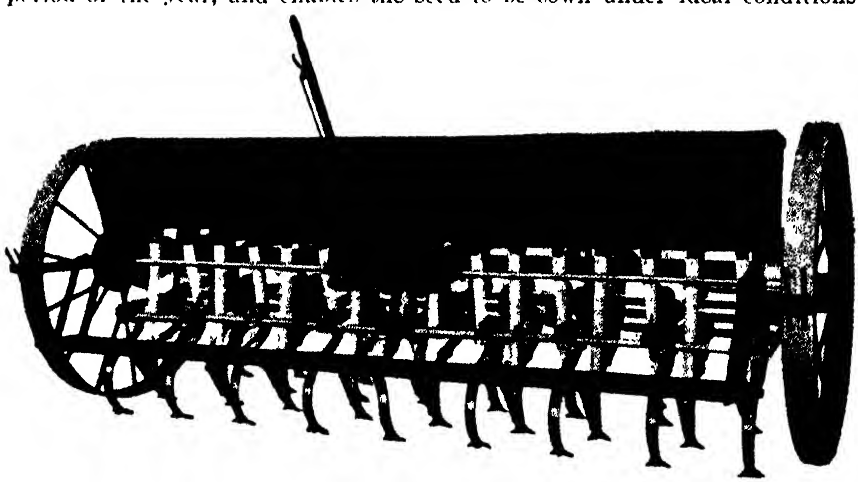
Skim ploughs are not used to any great extent. They are very effective for destroying weeds, but are much slower than the cultivators. On most of the country in this district the rigid tine scarifier is a more suitable

implement, although the skim plough has been found very useful on some of the light soils, particularly light mallee country, where, if used judiciously, it is of great assistance in consolidating the subsurface soil.

Rollers are not used in many parts of the south, although the importance of subsurface consolidation has led a few farmers to experiment during recent years with this implement. On some soils when a roller or cultipacker is used just before sowing and the land then harrowed, great benefit has resulted. More experience with the roller is required before any general recommendation could be made.

It is significant, however, that the spiked roller is in general use in the Corowa and other districts near the Victorian border. The rollers are here used to break down heavy clods, and to assist in the compaction of the subsurface soil. The farmers in these localities usually exercise good judgment in their use of this implement. It can be taken as a definite rule when using a roller on wheat country never to leave a rolled surface, but always to follow the roller with a harrow or cultivator, so as to leave a loose cloddy mulch.

"Combine" drills.—These machines are a combination of springtooth cultivator with a grain and fertiliser drill. The great advantage is that one man can, at one operation, give a final cultivation to his fallow and drill in his seed and fertiliser. Apart from the saving of labour this is a great advantage, as it effects a considerable saving of time at this critical period of the year, and enables the seed to be sown under ideal conditions



A "Combine" Drill.

This implement combines the grain and fertiliser drill with the springtooth cultivator.

on a weed-free seed-bed and with a minimum loss of moisture. Without this implement it frequently happens that rain, falling after the final cultivation of a fallow, necessitates an additional cultivation before the seed can be sown. The sowing period is restricted even in favourable years, and an implement which enables the work to be carried out quickly is a big factor in eliminating the element of risk.

In using the combine for sowing, care should be exercised to ensure that the cultivator points do not cultivate too deeply and so spoil the consolidation. They should be adjusted to cultivate to the proper depth of sowing.

Cultivation of the Soil.

We are now well supplied with suitable varieties of wheat of improved strain, specially produced in Australia to suit our peculiar requirements, and we cannot now hope for any phenomenal increase in yields due solely to the introduction of a new variety, such as was the case when Federation was first grown. Increasing the amount of seed sown per acre, although advantageous under certain conditions, has its limitations as a means of increasing yields. An effective dry pickling process for the prevention of bunt has been evolved. Fertilisers have been widely tested, and are now in universal use throughout the south. At the present time, therefore, if we exclude the question of disease, the chief remaining factor on which we can work to effect any great improvement in wheat yields is the cultivation of the land, with which factor also the question of rotation is closely connected. It is not intended to discuss the theoretical aspect of fallowing in detail, but rather to confine the remarks, as far as possible, to practical suggestions regarding the cultivation of fallows.

In order that growers may have a definite mind-picture of the actual physical condition of a really good fallow to guide them in their cultivation, it is thought advisable to describe what may be considered an ideal fallow for the average medium to strong loams. If this ideal is kept in mind throughout the fallowing period, growers can determine whether their cultivations are bringing about the desired soil conditions or not, and modify their methods accordingly, instead of working fallows without any definite objective other than the destruction of weeds and the conservation of moisture. During March or April the ideal fallow on medium to heavy red loam would present a reasonably level surface, composed of small clods varying in size from 1 to 2½ inches in diameter. The surface mulch, which is intended to prevent evaporation of moisture from the fallow, would be from 2 to 2½ inches in depth. The fallow would be free from weeds, grasses, etc. Immediately beneath the cloddy surface mulch the soil would be fairly firm and would form an even and complete union with the unploughed soil below. No noticeable air spaces or buried clods would be found, and the soil would be moist to the top of the consolidated subsurface.

While this may be considered an ideal fallow for the average medium loams of the Riverina, some slight modifications are needed for certain other types of soil. These will be discussed later. When the fallow described above is sown, the seed is placed about 2 inches below the surface, and therefore rests immediately on top of the compacted seed-bed, which is the ideal position. When the seed germinates its roots strike immediately into the firm soil which is well supplied with moisture. Two factors, known as capillarity and surface tension, are responsible for the upward movement of moisture in the soil against the downward pull of gravity, and

this fact makes it possible to have the moisture right to within 2 inches of the surface in a well-worked fallow, even although no rain may have fallen for quite a considerable time.

Wheat demands a firm seed-bed, and does not grow so well when the seed-bed is loose and open. It is therefore disadvantageous to sow in a fallow which has been deeply worked just prior to sowing. Many an otherwise good fallow is marred by a deep working late in the season. As it is not advisable to sow deeper than 2½ inches at the outside, when the fallow is worked too deeply the seed cannot be sown on the compacted soil. Instead, it is sown on a lose seed-bed, and in a tricky season, when the moisture is scarce, there is often a possibility of the seed malting, having sufficient moisture to germinate it, but not sufficient to maintain it until the roots reach the stored moisture in the firmed soil.

When the mulch is only 2 to 2½ inches deep and the sub-surface soil is firmly compacted, it is an easy matter to decide whether it is safe to sow or not. If there is moisture right to the top of the consolidation the wheat will germinate and get a satisfactory start. If there is no moisture at the top of the consolidation, the seed can be sown dry, if necessary, without danger of it malting. When the mulch is too deep and loose, it is often a difficult matter to decide whether there is sufficient moisture to germinate the seed satisfactorily or not.

Fallowing.

Conservation of moisture is one of the main objects in fallowing, and the longer the land is lying in a receptive condition the more moisture will be absorbed. Therefore, the land should be ploughed as early as possible, particularly in the drier districts. If possible all the ploughing should be completed by June and July. Experiments and observations have proved that, throughout most of the wheat belt, each month the fallowing is delayed means a reduction in the ultimate wheat yield. There is no doubt whatever that land fallowed in June and July will, other things being equal, give a better yield than that fallowed in August and September.

It is found that 4 to 4½ inches is a suitable depth to plough, and even shallower ploughing is satisfactory. In the drier localities an occasional slight variation in depth is all that is required to prevent the formation of a hardpan.

When to Harrow.

On most soils it is not advisable to harrow the land after this early ploughing. It should be allowed to lie in this rough state, so that it can readily absorb moisture, also that weathering agents may act upon it. Practically no rain runs off a ploughed surface; it soaks in and is stored in the sub-soil. Being rough and open, the land is also in a suitable condition to derive full benefit from the action of the air, frost, and sun. It is a mistake, therefore, to break down the comb with heavy harrows on most soils.

On some of the heavier and cloddier soils, however, harrowing after ploughing is sometimes advisable. If soils that are always rough and cloddy are harrowed down soon after ploughing, many of the clods will be considerably reduced in size, which is a great advantage, enabling the summer cultivation to be carried out without any inconvenience from overlarge clods. These rough, cloddy soils, if not worked down somewhat during the winter while moist, are very hard to deal with later. The clods become dry and hard in the summer, and none of the ordinary implements are capable of breaking them down to handier sizes.

Cultivating the Fallow.

Harrowing immediately after ploughing is not to be condemned on the self-mulching types of soil (such as black borce country), nor even on the red or brown semi-alluvial soils, small areas of which occur throughout the district. However, on all soils that set after rain and on which it is desirable to maintain a cloddy mulch (excluding the extra cloddy soils mentioned above), it is not advisable to harrow after ploughing, as this practice helps to make the surface too fine without improving the condition of the soil below the surface. When the soil begins to dry up in the spring (end of August or beginning of September), the fallow should be worked with a springtooth cultivator or similar implement so as to prevent evaporation, and to prepare the soil for future workings. This first working should be deep. In fact, the cultivator should be set to the full ploughing depth. Fine points should be used so that the clods will be brought to the surface while the finer particles of soil work to the bottom. It is important that this cultivation be given before the soil begins to lose moisture by evaporation in the spring.

An Ideal Fallow at Corowa.
Note the cloddy condition of the surface.

From this point no definite rules as to the actual date of cultivation can be given. All subsequent cultivations, however, should be shallow (not deeper than 2½ inches), so that the sub-surface soil may become consolidated.

Judgment must be used in deciding when and how to cultivate the fallow after this stage. It is not advisable to work a fallow when it becomes too dry, as little benefit, if any, will result. The most suitable time for cultivation is as soon after rain as possible. It can definitely be stated that, other things being equal, a fallow receiving a sufficient number of cultivations will produce a heavier yield than one which did not receive so many. Cultivating the soil definitely increases fertility and makes possible the production of heavier yields, and, although it is not necessary to cultivate after every fall of rain occurring during the summer, it is advisable to work the land after every fall sufficiently heavy to form a surface crust. For this operation the harrows, springtooth cultivator, or rigid tine scarifier may be chosen according to the condition of the fallow, the type of soil, and the presence or absence of weeds. If the soil is medium to heavy loam and is free from weeds the harrows or springtooth cultivator would serve. If semi-alluvial brown loam, light red loam, or heavy black self-mulching soil, and free from weeds, the harrows would be the most suitable implement. If heavy red loam or clay country, or if weeds are prevalent, the rigid tine scarifier should be used.

This system of cultivation is carried out until the sowing period approaches. On the medium to heavy textured soil an effort should be made to maintain a cloddy surface so as to prevent evaporation, and also to prevent the surface of the soil setting down hard after heavy rains. However, one must expect a fallow to possess a cloddier surface in October, say, than in April or May, and no great anxiety need be experienced if the surface, on account of frequent cultivations, is getting rather fine towards the sowing season. The surface appearance of a fallow does not tell us everything. The condition of the land below the surface is equally important. All the details of what the ideal fallow looks like must be kept in the mind's eye, and every working must be carried out with this definite objective in view. It is, therefore, advisable for the operator to get off his implement occasionally to examine the work being done.

It is difficult to obtain useful data from field experiments regarding the number of cultivations required by fallows, but numerous instances have been noted in all parts of the southern district where the omission of one necessary cultivation during the summer has resulted in a subsequent reduction of yield. To illustrate this point, I will quote the experience of Messrs. Maguire and Fehon, of Barmedman. Portion of their fallow was cultivated in December, 1924, but the rush of harvesting prevented the completion of the work. The whole paddock was subsequently cultivated after harvest. In all other respects the treatment of the two portions was identical. The rate and time of seeding, variety (Waratah), and amount of superphosphate were the same in each instance, yet the portion receiving the cultivation in December, yielded at the rate of eight bags to the acre, while that receiving no cultivation during December yielded only four bags to the acre. This is an outstanding difference, due partly to the growth of weeds on the fallow, but it serves to illustrate what is happening (though perhaps to a lesser degree) to many other farmers throughout the State.

Sheep on the Fallow.

Sheep are of tremendous value on fallows, and this fact is now fully realised by wheat-farmers in the south. Those in the fortunate position of having sufficient sheep keep their fallows fully stocked during the entire fallowing season. The system adopted by many progressive mixed farmers is to keep a flock of wethers specially for grazing the fallows. The fallow should be stocked heavily while paddymelons and such unpalatable weeds are young. In this way the fallows never get out of hand, and the sheep cheapen the cost of production by reducing the number of cultivations necessary to keep the land free from weeds. A flock of wethers withstands the treatment better than ewes, and after being kept on the fallow until it is cleaned up, they quickly pick up their lost condition if put on to good feed for a period. They are then ready for close grazing on the fallow again when necessary. Sheep not only keep fallows free from weeds, but they also greatly assist in bringing about a good compaction of the sub-surface soil. A flock of sheep is absolutely essential to the economical working of a wheat farm.*

(*To be continued.*)

* In next issue Mr. Clayton will discuss special methods of cultivation in relation to particular types of soil.—Ed.

Tubercle-free Herds.

The following herds of cattle have been submitted to the tuberculin test by Government Veterinary Officers or approved veterinary surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd :—

Owner	Address.	Breed.	Number tested.	Expiry date of this certification.
Department of Education	Eastwood Home ..	......	10	7 Oct., 1926.
Do do ...	Hurlstone Agricultural High School.	......	47	23 Nov., 1926.
Do do ...	May Villa Homes ...	.. ...	6	8 Jan., 1927.
Do do ...	Yanco Agricultural High School.	......	29	14 Jan., 1927
Walter Burke	Bellefaire Stud Farm, Appin	Jersey..	36	19 March, 1927.
Department of Education ...	Gosford Farm Home	......	32	16 April, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
William Thompson Masonic Schools.	Baulkham Hills ..	.. ...	33	15 June, 1927.
Department of Education ..	Mittagong Farm Homes.	......	33	7 July, 1927.

—Max Henry, Chief Veterinary Surgeon.

The Newer Varieties of Wheat.

Descriptive Notes of a Few.

[Continued from page 651.]

J. T. PRIDHAM, H.D.A., Plant Breeder.

Duri.

A rather scanty stooler, with erect habit of growth and resembling Canberra, except that the straw is better. Duri is doing well in dry districts. The light-brown tapering ear is tip-awned and the spikelets are set irregularly. The straw, though somewhat slender, is tough and of medium height. The grain is in the soft white flour class, dark yellow, threshing readily and not liable to shatter. Duri ripens with Canberra and shows to advantage in a year of light rainfall. The cross was made by Mr. Hurst at Wagga with the following pedigree:—

Federation x Volga Barley — Federation x Volga Barley

Hurst's No. 14 — Canberra

Duri

Early Bird.

Early Bird was selected at the Wagga Experiment Farm and is a sister to Canberra with a white, nearly bald, tapering head and slender straw of fair height. The somewhat dark-yellow grain is of the soft flour class and easy to thresh. Early Bird stools sparsely and ripens between Clarendon and Sunset, and is unsuitable for any but the driest districts. It is perhaps best adapted for hay, having more length than Sunset.

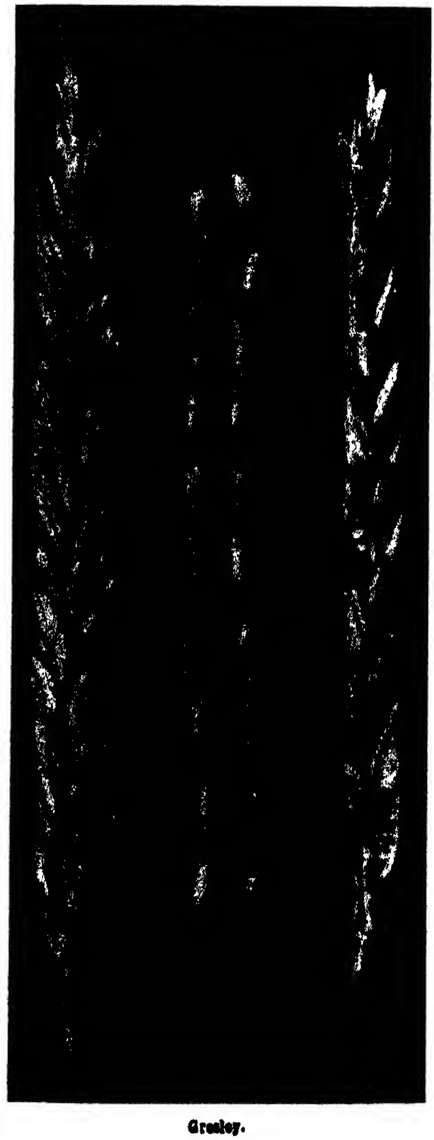
Gresley.

Gresley is not an abundant stooler, but yields heavily for hay and is a good grain variety, ripening with Hard Federation. The long white tip-awned ears are tapering and not dense. Gresley does not shatter, and the long, large, yellow grain is rather soft, with good flour colour. It is taking the place of Firbank, except in the very dry districts, and also does well on the coast. The result of a cross between Federation and Huguenot, made in 1909 by Mr. Charles Harper, of West Australia, Gresley was introduced by Mr. Grasby, of the *Westralian* newspaper, and it has gained a footing in this State as a general purpose variety. It is moderately susceptible to rust.

Gluyas (or Early Gluyas).

An early ripening wheat grown in South and West Australia for its drought and rust resisting qualities, Gluyas was selected by a farmer of that name in Telowie, South Australia. It has a brown tip-awned head with irregularly set spikelets and rather large darkish yellow grain of the soft white class. Gluyas makes chaff which weighs well, the straw being thick walled, though slender and inclined to lodge.

Durl.

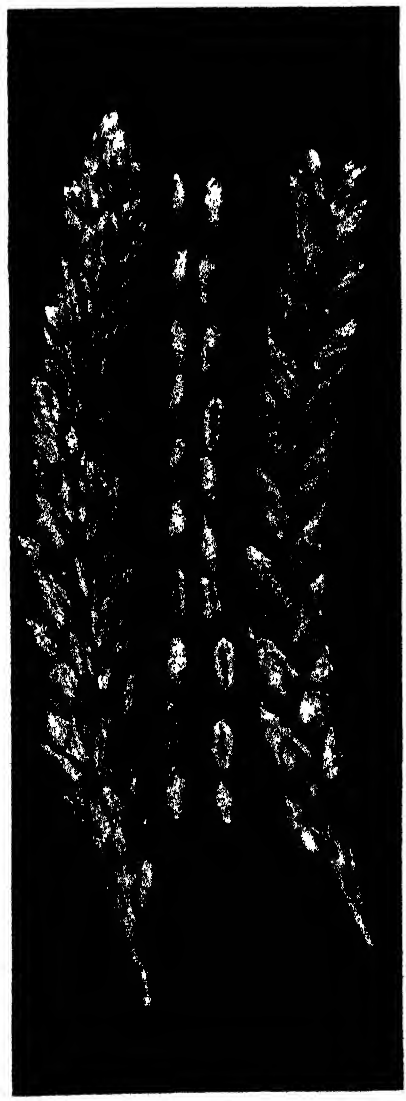


Gresley.

Hard Federation.

This was a selection from Federation made at Cowra—in all probability the result of a natural cross between that variety and Comeback. The ear resembles Federation, but is bolder and more lax; the grain is more rounded, being rather flinty or translucent. Hard Federation ripens about a week earlier, and the straw is a little taller than Federation. It is a very vigorous grower and does better in a loamy soil with moderate rainfall, while Federation prefers a stiffer soil with more moisture. Although the

Hard Federation.



Onas.

glumes leave the grain to some extent exposed, bleaching is not serious with this variety and shattering does not occur. Hard Federation grain is in the medium strong class, and is very useful to millers for blending purposes. It is not disease-resistant, and does not differ in this respect from the old Federation.

Major.

This is a late ripening wheat (the same season as Warden and Currawa), the result of a cross between Federation and Wallace made by Mr. H. Pye of Victoria. The ear is white, clubbed, with a slight awn at the tip, and the white somewhat coarse straw is remarkably stout and strong. The grain is rather large, white and in the soft white class, threshing readily. Major succeeds only in districts of good rainfall and seems to prefer moist clay soils.

Minister.

Minister ripens with Federation and has a white, clubbed nearly bald ear, the white straw being of medium height and not very stout. Its grain is yellow, rather flinty, and classed as medium strong. Minister does not shatter and yields fairly well in the Riverina districts. A crossbred of Mr. Pye's, of Victoria, the pedigree is as follows:—

Fife x Indian

Dart's Imperial x Unnamed

Unnamed x Dart's Imperial

Minister

Onas.

Onas is a midseason wheat, ripening a day or two before Yandilla King. It is a cross between Federation and Tarragon made by Mr. F. Coleman, of Saddleworth, South Australia. The almost bald ears with short glumes are typical of Hard Federation, except that they are white in colour. The straw is white, of medium height, and stands well for stripping. Its white grain of average size yields flour of the medium hard to weak class. Onas appears to suit districts where Federation is grown and is worth further trial in such centres.

(*To be concluded.*)

CORRECTION—In a report on page 651 of the September issue of the *Gazette* of experiments at Glen Innes Experiment Farm with sulphur as a fertiliser for White Tartarian oats certain erroneous figures crept in. The increase from the application of 1 cwt. superphosphate and 244 lb. sulphur should have appeared as 7 bushels 35 lb., making the value of the increase £1 19s. 4d., and the loss on the treatment £1 16s. 4d. The figures constituted the average of three years' results.

Seed Maize Contests.

LOWER NORTH COAST, 1925–26.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

KEEN interest was again displayed in seed maize contests on the Lower North Coast during the season, particularly on the Manning River where the sixth annual competition conducted under the auspices of the Manning River Agricultural, Horticultural and Industrial Association was brought to a successful conclusion.

The Mount George (Upper Manning) Agricultural Bureau ran its second contest with one plot - a re-sowing, the first having been spoilt by unfavourable weather conditions. This is the first completed contest on the Upper Manning, last season's plot having been damaged by heavy rain and windstorms.

The Macleay Agricultural Society conducted its fifth annual contest (three plots (one of which was totally destroyed by hailstorm) for main varieties, and one plot for the Golden Superb variety

Entries.

In the Manning River contest there were twenty-five entries. It has been found necessary to limit the entries, otherwise the competitions, which entail a considerable amount of work in triplicate, will become too unwieldy. The samples forwarded for sowing were mostly the result of careful selection. Seed was mostly true to type, even, plump, of good depth, and a bright colour. One Leaming entry showed weevily grain. Messrs Flett's and Macdonald's Fitzroy entries were of Pride of Hawkesbury type, this character being noticeable in both grain and growth. Mr. Mooney's No. 1 Fitzroy was pale, streaky, and light, showing the effects of electric treatment, and both Silvermines lacked that depth of grain one found associated with the variety in the earlier contests, when it was always among the leaders. These were the exceptions. The difference of 30 bushels between the first and last entries in the yield table compared with 38 in last year's contest may be one indication of more careful selection of seed for this year's contest.

In the Mount George Bureau Competition there were twenty-five entries, including some early and late maturing varieties entered non-competitively by the Department of Agriculture, the object being to test the capabilities of varieties not widely known or extensively grown in the neighbourhood against farmers' varieties and strains, and to have the leading sorts popularised. This practice was adopted in the early contests conducted by the Manning and Macleay societies, but is now discontinued owing to most of

the recommended sorts being grown in the districts. The Mount George entries were good to indifferent, but the fault will be remedied in time. Farmers will find it unprofitable to grow any sort of seed.

On the Macleay, there was a slight falling off in entries in the main competition, due mainly to a misunderstanding as to whether entries outside the district were acceptable or not. In the Golden Superb plot, however, the fourteen entries were equal to the highest number received for the plot. The "main" entries were mostly an improvement on past samples. Mr. O'Dell's Silvermine and Yellow Hogan, Mr. Ainsworth's and Mr. A. E. Booth's Hawkesbury Hogan were somewhat irregular. The differences between the first and last entries (omitting the last two in each contest) in the present season and in last season were 21 bus. (thirteen entries) as compared with 34 bus. (twenty entries), showing a better selection throughout, probably in favour of this year's entries.

THE MANNING PLOTS.

Three plots were selected for the competition, two being the same portions of land as those on which last year's plots were grown, viz., Messrs. W. M. Macdonald, Taree Estate, and J. P. Mooney, Dumaresq Island. Mr. R. Richardson's plot at Mondrook was made the third. Although a keen supporter of the competitions since their inauguration as a competitor, this was Mr. Richardson's initial attempt (and a successful one) as a plot grower.

Dry, cold, wintry conditions prevailed throughout September and October. One or two useful rainfalls were registered, but being followed by dry windy conditions were rendered useless. Most of the early growth was irregular and checked, the former being due to uneven germination. From the break in the drought in late October until mid-January the rainfall was above the average, and excellent growth on all plots took place. But another long dry spell followed in late January, February and part of March, accompanied by terrific heat and high winds—quite the worst experienced, for the time of the year, for many seasons. This had a detrimental effect on the plots. Heavy rain followed in March and April, bringing relief, and also, in the late spring-sown plots, "blight" in a more or less severe form, thus further reducing the yield. Under the circumstances the results were very good.

RAINFALL, TAREE (CENTRAL).

1925	Points.	1926	Points.
August	404	January	123
September	26	February...	156
October	185	March	717
November	492	April	418
December	390	May	562

The Mondrook Plot.—Portion of a paddock that, prior to 1924, had been for many years under pasture and had latterly grown two maize crops was selected. Prior to sowing the land was twice ploughed, once early, and

several times harrowed. The soil, a medium heavy loam, was in good order for sowing on the 9th September. Germination, although slow and irregular, was better than in the other plots, there being a large percentage of "four's" in the hills. Three cultivations were given, the crop at one period being weedy. After the October rain the crop "evened up" and maintained a steady growth. The setback caused by the dry, late summer drought was less severe here than on the other plots, due, no doubt, to the ground being newer and better charged with organic matter; "blight" after the autumn rains was negligible. Superphosphate at the rate of one bag to the acre was applied.

Taree Estate Plot.—The soil (a medium to heavy loam) was ploughed early and field peas were sown in June. A fairly heavy growth of these was ploughed under in August. After a fortnight's rest the land was ploughed, harrowed, and rolled, being somewhat cloddy. Dry conditions continued and rather than wait too long for rain (Mr. Macdonald believes in early sowing) it was decided to give another ploughing and then sow. This latter operation caused the dry clods to be turned under, and the moist fine soil to be brought under the influence of drying westerly winds. Consequently the seedbed was patchy—dry and moist. Those grains falling in the moist places germinated at once and some of those in the drier spots not until after a light rainfall. Instead of "three's" and "four's" the great majority of hills only contained "two's" and "three's" and the field had an uneven appearance. After the break in the drought in October the crop evened up and made satisfactory progress. It was cultivated a number of times during growth. The late summer drought, and an attack of blight following the March rains, caused the crops to ripen rapidly. The average yield was 16½ bushels lower than on the same land last year.

Dumaresq Island Plot.—This plot was also sown on exactly the same portion of land as last year. The stalks and rubbish were ploughed under in June, after which the land was fallowed until the first week in August. It was then rolled, harrowed and double-disced, and ploughed again late in August. Following this it was rolled, harrowed, and double-disced, and ploughed again on 11th September, and twice harrowed. The soil was of a loamy nature. The plot was sown on 15th September. Old farmyard manure at the rate of 3 or 4 tons to the acre was applied evenly in the drills, also a bag of superphosphate to the acre and a light topdressing with nitrate of soda during early growth. Germination was patchy, and early growth was slow, but after the October rains good progress was made. In January it was estimated the crop would exceed any previously grown on the farm, but the long dry spell in late summer, and a severe "blight" attack following the autumn rains, played havoc with the crop, causing premature ripening. The sample of seed harvested was the dampest of the three. Several cultivations were given during growth.

Performances.

The highest average yield of 119 bushels 10 lb. by Mr. Macdonald's Pride of Hawkesbury falls a long way short of last year's record of 131 bushels 9 lb., put up by the same variety. The falling off is due entirely to the unfavourable season. This is Pride of Hawkesbury's second consecutive win, and it now shares with Fitzroy and Large Red Hogan the honor of winning two contests. In a drooping season Pride of Hawkesbury suffers considerably from fungus disease, the shelled sample containing much mouldy grain, but in a medium to dry season, especially over the maturing stages, this defect is almost entirely absent. The majority of entries of the variety occupied positions well up in the table of yields. Fitzroy, now the most widely grown variety in the district, filled second, third and fourth positions, but its average this year for all entries was not quite as good as that of Pride of Hawkesbury, nor that of Large Red Hogan. However, Fitzroy can be relied upon to do well under all conditions.

Leaming did not do as well as in last year's contest. Manning Silvermine, a variety that could once be relied upon to yield remarkably well, has fallen off considerably. The high yielding strains have been lost These medium early varieties failed to "hold out" over the dry spell like the later maturing entries.

RESULTS of Competitions, 1920 to 1926.

Season.	Winning Competitor.	Winning Variety.	Average Yield per acre.	Grower of Heaviest Plot.	Average Yield Heaviest Plot	Owner.	Highest Individ. Yield.		Number of Plots Harvested.	Number of Entries in competition.
							Name of Variety.	Yield.		
			bush.lb					bush.lb		
1920-21	D. Dorward	Fitzroy ..	111 44	V. Murray, Pampoolah	No moisture determination taken.	Dept. of Agriculture..	Whitecap Horsetooth	146 3	4	11
					bus lb.					
1921-22	J. P. Mooney	Large Red Hogan.	120 49	J. P. Mooney, Dumaresq Island.	115 14	S. E. Everingham.	Manning Silvermine.	149 16	3	19
1922-23	G. Levick .	Large Red Hogan.	97 50	W. Muscio, Glenthorne.	95 30	Dept of Agriculture.	Whitecap Horsetooth	118 0	2	26
1923-24	J. P. Mooney	Fitzroy ...	118 25	W. Macdonald Taree Estate.	104 5	J. P Mooney	Fitzroy ...	122 5	3	31
1924-25	S. Flett ...	Pride of Hawkesbury	131 9	W. Macdonald, Taree Estate.	118 33	S. Flett ..	Pride of Hawkesbury	143 4	3	20
1925-26	W. Macdonald	Pride of Hawkesbury	119 11	R. Richardson, Mondrook.	105 10	J. P. Mooney	Fitzroy ...	126 50	3	25

Nine out of the twenty-five entries failed to reach the 100 bushel average compared with three in the twenty entries last year. The highest individual yield, 126 bushels 50 lb., put up by Mr. Mooney's Fitzroy No. 1 was exceeded by only four entries in last year's contest, but the second yield this year (119 bushels 28 lb) was exceeded by no less than fourteen entries last year.

The highest average plot yield, 105 bushels 10 lb. at Mondrook, was 13 bushels below the heaviest average plot last year. Both of these plots were the earliest sown (September), and it is worthy of mention that whe e a few years ago the late sowing (November) was probably the most reliable – in fact, one or two contests have been won with November sowings—the altered seasons have made the difference. Formerly the early sown plots ran into a dry November (tasselling time) and matured in a drooping season. During the past few years, however, November has been marked by heavy rain, and late January and February have been unusually dry. Fortunately the plots in this competition were not sown as late as October or November, otherwise there would probably have been disastrous results.

The table shows that Fitzroy, Large Red Hogan and Pride of Hawkesbury have been the most prominent. No one grows Whitecap Horsetooth, chiefly because of the pale inocculated type of grain. Still it is undoubtedly a heavy yielding sort, late maturing and mostly free from fungus pests. Seasons have a marked influence over the yields.

TABLE of Yields

Competitor	Variety	R. Richardson, Mondrook		J. P. Mooney, Dumaresq Island		W. M. Macdonald, Taree Estate		Average Yield of three plots	
		bush.	lb.	bush.	lb.	bush.	lb.	bush.	lb.
W. M. Macdonald	Pride of Hawkesbury	119	28	118	42	119	20	119	11
J. P. Mooney ...	Fitzroy (No. 1) ...	101	12	126	50	119	28	116	48
S. Flett	Fitzroy	112	21	107	14	117	27	112	21
W. Macdonald ...	Fitzroy	117	7½	108	15	107	8	110	47½
G. Levick... ...	Large Red Hogan ...	114	0	108	25	107	52½	110	7
S. Flett	Pride of Hawkesbury	108	33	112	47	108	38	110	2
Dempsey Bros. ...	Pride of Hawkesbury	116	16½	106	41	103	0	108	47½
J. C. Stitt ..	Pride of Hawkesbury	105	38½	111	14	101	18	106	5
R. Richardson .	Large Red Hogan ...	102	24	113	35	98	41	104	52
W. Murray .	Fitzroy	109	23	90	37	112	41¾	104	15
Chas. Drury ...	Large Red Hogan ...	105	17	102	48	103	7	103	42
J. G. Stitt ..	Large Red Hogan . .	115	51	100	43	89	24½	102	2
J. P. Mooney ...	Fitzroy (No. 2) ..	108	19½	93	12	103	54	101	47
J. G. Stitt ...	Pride of Hawkesbury	110	30½	89	29	105	13½	101	43
W. M. Macdonald	Large Red Hogan ...	104	18½	98	31	101	53½	101	34
R. Richardson ...	Golden Beauty ...	109	5	98	51	94	35	100	49
G. H. Smith . .	Large Yellow Horse-tooth.	97	27½	91	54	105	22	98	16
F. W. Hill (Wyong)	Fitzroy	102	35	95	52	93	35	97	22
S. Flett	Leaming	108	46	81	45	97	0	95	49
C. Lean	Leaming	92	29	89	16	99	3	93	34
D. Dorward ...	Fitzroy	93	39	92	19	93	25	93	9
C. Drury	Manning Silvermine	99	29	85	46	92	19	92	31
W. Ryan	Leaming	82	28	96	38	95	6	91	24
G. A. Smith ...	Manning Silvermine	92	45½	91	10	86	51½	90	17
C. Drury	Fitzroy	97	8	76	51	91	37	88	32

Mr. W. M. Macdonald wins the Manning River Agricultural, Horticultural and Industrial Association's cup for heaviest yield, and Mr. R. Richardson the cup for heaviest yielding plot. The average yields for the three plots were: R. Richardson's, 105 bushels 10 lb. per acre; W. M. Macdonald's, 102 bush els; J. P. Mooney's, 99 bushels 34 lb.

The results from electrified seed (Mooney's No. 1) are too indefinite for comparisons. The same grower's No. 2 entry was not electrified, but the seed was not of the same sample, and at Taree Estate and Dumaresq Island this entry germinated badly owing to seasonal conditions.

The distances of sowing were four grains in hills 3 feet apart, and drills 4 feet apart.

THE MACLEAY PLOTS.

Three plots were offered for the competition—one at Temagog, Upper Macleay, on Mr. E. Ducat's farm, and the other two on the central river at East Kempsey and Pola Creek. All were in well known maize centres, and with typical Macleay farmers.

RAINFALL—KEMPSEY.

1925.	Points.	1926.	Points.
August ...	411	January ...	357
September ...	9	February ...	390
October ...	136	March ...	407
November ...	541	April ...	222
December ...	650		

No registrations were available from Temagog but they were considerably less in December, January, February and March than at Kempsey.

Although a good fall of rain was registered in August, the greater part of the spring was dry, cold, and windy. The value of another fall in October was discounted by the high winds following. During November, December, and early January the rain was above the average and crops did splendidly. Very dry and hot conditions followed, lasting seven or eight weeks, when wet conditions again came. The dry conditions, and then blight following autumn rains, had a detrimental effect on the crops.

The Temagog Plot.—This was a rich alluvial soil, typical of the best Upper Macleay flats. The land had grown maize almost continuously. Early sowing suits this district best, the likelihood of a few late frosts not causing the farmer any alarm. After the removal of the stalks by burning, a deep disc ploughing was given early in July. The land was again shallow disced late in August, followed by workings with the harrow. The soil, being light, was easily worked into a mellow seed bed for sowing on 2nd September. Germination was good and early growth slow. After the break of the drought in November growth was rampant, reaching 12 to 14 feet in height. The crop promised to be a record one, but after the unfavourable conditions, mentioned previously, it did not yield up to expectations.

Pola Creek Plot.—This plot was situated on a heavy red loam, originally the homestead farm of the Verge Estate. Years of cropping, chiefly to maize, had taken place, the fertility being replenished periodically by changes to pasture, green manure crops, and deposits from big floods. The soil was a light loam. Peas were grown in the winter of 1924 and late maize in the

summer of 1924-25. After the removal of the stalks, the land was ploughed early in September and rolled and sown on the 16th. The splendid crop with only one ploughing (Mr. Ainsworth generously offered the land at the last moment) speaks well for the fertility of the soil under adverse conditions. The dry spell was not felt quite so seriously here as up the river, an occasional thunderstorm occurring, and there was practically no "blight."

East Kempsey Plot.—This soil was of a loamy nature, of a lighter colour than the others, and on appearances not so fertile. Maize had been grown previously for many years here—sixty, so it is said. The land was ploughed at the end of July and left in the rough. It was so hard and lumpy that it was found impossible to break the clods before a fall of rain in October, when it was harrowed and rolled, and again twice harrowed. A ploughing was given on 20th November, disced twice, harrowed, rolled and harrowed. It was in good order for sowing on 25th November. Superphosphate at the rate of one bag to the acre was used. Growth was excellent from the start, although the stalks were inclined to be spindly looking, due to the rapid growth. It weathered the dry late summer months well (being sown later than most late sowings for the district) only to be totally destroyed by a very severe hailstorm in March.

Performances.

The highest average yield, 110 bushels 38 lb by Mr. J. Booth's Yellow Hogan, was 6 bushels below last year's record. The season, however, was infinitely more favourable then. The same grower's Yellow Hogan was the leading local entry in the 1921-22 contest, and it has done well in subsequent contests —a really high yielding strain of the variety. Yellow Hogan is a fairly late sort, growing a moderately long cob, and grain of a bright yellow colour, the shelled sample being very attractive. It does well under all weather conditions, and was for years the leading Macleay variety, but now shares popularity with Fitzroy, which variety filled third, fourth, fifth, seventh, and tenth places in the present contest. Large Red Hogan yielded best at Temagog and filled second place. Although a good yielder it is not a popular variety, growing rather coarse, and often producing bad cobs.

Leaming did not do as well as last season.

Seven out of the fifteen entries topped the 100-bushel mark, compared with eleven out of twenty-two entries last season. The highest individual yield was 116 bushels 11 lb. put up by Booth's Yellow Hogan at East Kempsey.

The highest average plot yield for the season, 99 bushels 3 lb. at East Kempsey, was 9 bushels lower than last year's heaviest plot, and 11 bushels below the record.

The committee decided to revert to the four grains in hills 3 feet apart, and drills 4 feet apart, instead of the 2 feet 9 inches apart and 3 feet 9 inches drills in last season's contest.

RESULTS of Competitions, 1921 to 1926.

Season.	Winning Competitor.	Winning Variety.	Average Yield per acre.	Grower of Heaviest Plot.	Average Yield Heaviest Plot.	Highest Individual Yield. Owner.	Variety.	Yield.	Number of plots Harvested.	Number of Entries.
			bush. lb		bush. lb			bush. lb.		
1921-22	Dept. of Agriculture	Large Red Hogan.	92 28	H. Wheeldon Gladstone	89 6	John Booth	Yellow Hogan	116 27	3	22
1922-23	J. P. Mooney (Taree)	Fitzroy	86 50	H. Wheeldon, Gladstone	86 28	John Booth	Hawkesbury Hogan.	103 23	3	32
1923-24	Messrs. Brown and O'Shea	Fitzroy ...	108 42	D. Duncan	110 35	Brown and O'Shea	Fitzroy .	137 52	3	24
1924-25	D. Duncan	Whitecap Horsetooth	116 5	E. H. Ducat	108 53	S. Flett ..	Leaming	134 20	2	22
1925-26	John Booth	Yellow Hogan.	110 38	C. Ainsworth	99 30	John Booth	Yellow Hogan.	116 11	2	15

Fitzroy and Yellow Hogan have done best in competitions to date, and are the most reliable varieties for main crop sowing on the Macleay. Whitecap Horsetooth is also a highly recommended variety, but farmers prefer varieties giving a brighter and more evenly coloured sample.

TABLE of Yields.

Competitor.	Variety.	Lemagoe Plot.	Last Kempsey Plot.	Average Yield per acre Two plots.
		bush. lb	bush. lb	bush. lb
John Booth	Yellow Hogan	105 8	116 11	110 38
John Booth	Large Red Hogan	111 1	105 43	108 22
E. H. Ducat	Fitzroy	101 52	108 53	105 24
J. P. Mooney	Fitzroy	97 10	109 50	103 30
V. Wright	Fitzroy	102 54	99 41	101 19
W. J. Seargent	Leaming	97 50	104 15	101 4
F. W. Hill	Fitzroy	87 28	112 35	100 3
A. E. Booth	Leaming	100 26	98 42	99 34
C. Ainsworth	Hawkesbury Hogan	98 14	98 31	98 22
F. Waters	Fitzroy	101 5	94 30	97 40
H. H. Booth	Yellow Hogan	91 45	100 15	96 2
A. E. Booth	Hawkesbury Hogan	93 52	90 36	92 16
E. H. Ducat	Leaming	67 33	92 5	89 47
W. F. O'Dell	Manning Silvermine	81 51	85 36	83 43
W. F. O'Dell	Yellow Hogan	80 16	75 19	77 45

Average yield C. Ainsworth's plot, 99·30 bushels per acre.
Average yield E. H. Ducat's plot, 96 bushels per acre.

GOLDEN SUPERB CONTEST.

This competition attracted fourteen entries, and was probably the most successful yet held. Prior to 1923, Golden Superb was grown very little outside the Macleay, where it has always been a very popular early maturing

variety, but since the results of the seed contests have been published its value is being appreciated in other parts. As proof of this it may be stated that one grower alone on the Macleay last season disposed of 170 bushels of pure seed of the variety—a great quantity of which found its way to maize districts in Victoria and Queensland. Reports show that Golden Superb is adapting itself well to the different classes of soil and climate in the neighbouring States, and establishing itself in the very high opinion of maize growers in those parts. It is doubtful whether, in such a short time, any other early maturing variety has become so popular. Briefly it may be stated that Golden Superb matures in fine months (perhaps a shade longer than some of the original types), thus allowing ample time to prepare the land for winter fodders. It is very dependable, *i.e.*, it will return moderate to heavy yields even under unfavourable conditions, and it is one of the early varieties that will give satisfactory yields sown late. Golden Superb is always remarkably free from weevil (for an early variety), being easily the outstanding early variety in this respect. This may be due to its comparatively hard grain and good husk covering. The grain is usually sound and clean but the colour is variable, ranging from reddish (with paler cap) to yellow. For weight per bushel measure it has very few superiors.

In the contest under review, sown on the same day as, and adjoining the main variety maize contest, it easily out-yielded those varieties, averaging 106⅓ bushels to the acre (with a maximum individual yield up to 117 bushels per acre) compared with an average of 96 bushels for the main plot, simply because Golden Superb had advanced beyond the danger stage and ripened under favourable conditions. The later sorts were caught at a critical stage in the droughty late summer months, and "blight" (following the March rains) further reduced the yield.

The samples of grain sent in for sowing were the best yet received, being sound, even in shape and colour and otherwise typical of the variety. There was one exception—Mr. R. Kesby's seed, which in grain and growth showed a strong admixture with Leaming.

The differences between the first and last strains showed a marked reduction, being 20 bushels for fourteen entries, compared with 53 bushels for thirteen entries in the 1924-25 contest; 29 bushels for fourteen entries in 1923-24, and 23 bushels for ten entries in 1922-23. This improvement is probably in keeping with the more even samples of seed sent for sowing this year

As early maturity is one of the main characteristics of the variety, growers with the earliest maturing strains should aim at the improvement of those strains. Ducat's No. 2, C. Ward's, and W. J. Seargent's were the earliest, and an interchange of a little seed between these growers would no doubt increase the yielding capabilities and not interfere materially with the maturity. Most of the other varieties matured from a week to a fortnight later, with R. Kesby's a fortnight still further back. The seed was hand-dropped four grains per hill.

The following were the yields :—

	bush.	lb.		bush.	lb.
F. Waters	117	3	W. J. Seargent	106	1
J. Skimmings	112	45	C. A. Ainsworth	106	1
C. Ward	111	6	W. H. MacMahon	105	10
E. H. Ducat, No. 2	110	15	J. Booth	102	35
A. Jeffery	108	32	A. E. Booth	102	35
R. Kesby	107	40	V. S. Kesby	97	30
G. Skimmings	106	49	E. H. Ducat, No. 1	97	30

Average yield, 106½ bushels.

MOUNT GEORGE CONTEST.

Mr. Ewan Andrews kindly offered a plot for this competition, which was sown on 17th September under adverse weather conditions, a strong westerly wind drying out the drills, which were already on the dry side and cloddy. Germination under the circumstances was very patchy and a re-sowing was made in another position on 27th November. This plot had previously grown lucerne, the old stand having been ploughed and sown to Saccaline during the autumn of 1925. After August the land was ploughed three times, the soil being in good tilth for sowing. Seed was hand-dropped and the drills covered in with a cultivator. Owing to the lateness of the season it was decided to sow three grains instead of four in hills 3 feet apart and drills 4 feet apart. Germination was fairly good; some of the samples, especially of the early sorts, had become weevily. With favourable conditions, good early growth was made. The severe drought period, however, extending from mid-January to mid-March, had a most detrimental effect on the crop, as the majority of the entries tasselled during that period. Rains from March onwards somewhat brightened the prospects, but only light yields were harvested.

Nevertheless the contest had its value in demonstrating which variety did best under the conditions. In this respect Fitzroy stood alone, three of the four entries of the variety filling first, second and third places—a fine performance and further enhancing its reputation as the best all round maize on the Central Coast under all conditions.

In farmers' trials conducted for a number of years in the neighbourhood, Golden Beauty, Leaming, and Manning Pride (a variety that originated on the Upper Manning) have mostly done best. The entries in the contest under review, however, only did fairly well. With more attention to selection of samples, and under conditions somewhat more normal, they should occupy higher positions. The late maturing sorts, other than Whitecap Horsetooth, one entry of Large Red Hogan, and Ulmarra Whitecap, were low on the list. In the section for early maturing varieties, Golden Superb yielded best. It especially and Craig Mitchell were mostly free from weevil, the others (Funk's Yellow Dent, Funk's 90-day, and Coodra Vale) being riddled. Golden

Superb is highly thought of, and becoming largely grown in the district. Maturing in about five months it supplies the early market, and allows of early preparation of the ground for winter fodders.

The following were the yields :—

	bush.	lb.
D. Cameron, Fitzroy	74	47
J. P. Mooney, Fitzroy	71	9
G. A. Andrews, Fitzroy	70	7
Department of Agriculture, Whitecap Horsetooth	68	28
G. Levick, Large Red Hogan	68	3
Department of Agriculture, Ulmarra Whitecap	64	54
G. A. Andrews, Manning Pride	63	3
Department of Agriculture, Leaming	61	49
G. A. Andrews, Leaming	60	50
D. Cameron, Golden Nugget	60	39
R. Richardson, Golden Beauty	59	45
C. Shields, "Somerset"	57	31
Elwin Andrews, Leaming	56	40
W. M. Macdonald, Large Red Hogan	56	36
Department of Agriculture, Broad Leaming	56	32
Department of Agriculture (W. H. MacMahon) Golden Superb	52	5
J. Campbell, Manning Silvermine	52	5
D. Dorward, Fitzroy	50	54
C. Shields, Manning Pride	50	48
Department of Agriculture, Funk's Yellow Dent	49	53
S. Flett, Pride of Hawkesbury	49	53
Department of Agriculture, Craig Mitchell	45	37
Department of Agriculture, Funk's 90-day	45	4
Department of Agriculture, Yellow Hogan	43	9
H. Ellison, Coodra Vale	41	47

The average yield of the plot was 57 bushels 14 lb.

GENERAL REMARKS.

With five completed contests on the Macleay and six on the Manning, one can state with some degree of accuracy that there are about three outstanding main crop varieties for each of the districts. That the effect of the competi tions in this respect, viz., the narrowing down of the field to the most desirable varieties, has been fairly well accomplished, must be regarded as satisfactory progress. In the present contest, three main varieties on the Macleay were represented by eleven of the fifteen entries, and by eighteen of the twenty-five on the Manning. Many farmers who once entered any sort of maize, now figure prominently with the more desirable varieties.

But full use of the competitions has not yet been made in this respect. We find a few farmers occupying prominent positions in the table of yields, year after year, with consistently high-yielding strains. Then there is the grower occupying alternately high and low positions, no doubt due to careless selection of seed and probably the fault of the farmer and not of the strain. Then again there are instances of the same farmer's strain losing ground year after year. A case in point is of a farmer whose variety previously won a contest, but has since gradually become so inferior that it now finishes very low down

on the l'st. It seems reasonable to expect that in this instance with the infusion of seed from the higher yielding strains and perhaps switching off on to a more desirable type of grain, an improvement would be effected.

There is a fourth type—the grower whose strain is consistently low, and that with a variety that occupied high positions in each competition. There seems no excuse for a grower of this kind. Consider his loss—averaging from 25 to 40 bushels per acre, or even a greater margin, less than the highest yielding strain of the variety! With an area of, say, 10 acres (and it is reasonable to presume he would grow similar seed, certainly not better, on his own plant) the annual loss would be from 250 to 400 bushels.

The competitions offer an excellent field for improvement work for all at fault. With the infusion of seed from high-yielding strains into his seed plot, a more careful selection of seed, and of a more desirable type, and then making two entries into a competition—one of this "improved" seed, and the other of seed of the poorer type—the farmer has a new interest at hand, and one likely to be most beneficial. This advice is also recommended to the grower who at present enters sometimes as many as three varieties, with probably the sole object of winning a cup.

A Plea for Pride in Livestock.

Years ago Ruskin gave the assurance that the more sentimental of economists need not fear the too wide spread of the formalities of a mechanical agriculture. To-day, however, there are grounds for such a fear. . . . The presence of a wise population implies the search for felicity as well as for wealth, and farmers, to get the utmost satisfaction from their calling, should have other interests besides that of securing the maximum financial return from their holdings. They would find, if they do not already know, that high class livestock, particularly horses, would give them much pride and satisfaction, and if they were to adopt a proper system of horsebreeding, their monetary returns would also be increased.—M. L. Kingdon, at the State Agricultural Bureau Conference.

A Departmental Definition of "Stud" Seed.

With a view to removing the confusion regarding the term "stud" seed as applied to cereals produced by the Department, it has been decided, on the recommendation of the recent conference of Agricultural Instructors of the Department, that the official denominations for the different classes be as follows:—

(a) *Stud* seed.—Seed from the Plant Breeder's plots.

(b) *Stud bulk* seed.—Seed supplied by the Plant Breeder to the experiment farms.

(c) *Standard* seed.—Seed raised by experiment farms and supplied to private farmers and for farmers' experiment plots.

The name "pure seed" will be applied, as previously, to the seed raised by private farmers from experiment farm seed.

Rice-growing.

Its Possibilities on the Murrumbidgee Irrigation Areas.

W. R. WATKINS, H.D.A., Agricultural Instructor.

Rice-growing is generally associated in the public mind with countries in which cheap labour is abundant. As a matter of fact it is a crop in which modern machinery can be effectively used, and the crop can be handled much in the same manner as wheat. Successful rice culture is dependent upon :—

1. High temperatures during the growing season.
2. A dependable water supply during the period of irrigation.
3. Soils that are comparatively flat or level, and overlying an impervious subsoil.
4. Good surface drainage.

The Historical Aspect.

The idea of growing this crop, and the likelihood that it may become a profitable industry, is by no means new to the Department of Agriculture, as trials have been conducted on the Murrumbidgee Irrigation Area, as well as other parts of the State for a number of years, but until the last two years it had not been tried out on a commercial scale in New South Wales.

The Department's first experiments were in 1891, when fourteen varieties of " upland " rice were received from India and distributed amongst farmers on the Macleay, Clarence, Richmond, and Tweed rivers for trial. The results were not encouraging, and it was not till 1911 that the crop was given a further trial, when more seed of the " upland " varieties was obtained from the central provinces of India and grown at Hawkesbury Agricultural College, and Grafton and Yanco Experiment Farms. These trials were practically failures, as the crops were grown under natural rainfall, which proved insufficient, and the climatic conditions were unsuitable.

In 1916 the first trial with " lowland " rice was conducted at Yanco Experiment Farm, with a variety that had been experimented with for a number of years by a Japanese resident of Swan Hill, Victoria, who claimed to have obtained 1 ton of grain per acre. Again only poor yields were obtained, and the following year's results were no better, but as the price paid for rice at the time was £45 per ton, with every indication of it reaching £60, it was thought advisable to persevere with the crop.

In 1922 a small experiment was carried out near Leeton with seed of three varieties obtained from America, namely Colusa, Caloro, and Wataribune. The trial covered an area of about 2 acres, and was under the supervision of Mr. A. N. Shepherd, then Agricultural Instructor on the Area, who at that

time forecasted a great future for this crop. Difficulty was experienced in preparing the land and holding the water at correct levels, but the crop made good growth and yielded well, as can be seen from the following figures :—

Wataribune	77 bushels per acre.
Caloro	72½ ,,
Colusa	72 ,,

The weight of a bushel of rice is reckoned at 42 lb.—53 bushels to the long ton (2,240 lb.). In parts of America the short ton of 2,000 lb. is used when handling rice.

Successful trials were also conducted at Yanco Experiment Farm, the manager in his report stating that, " If a suitable market opens there is no reason why rice should not become one of the main crops on those low-lying parts of the Area where there are means of draining off surplus water."

Promising Returns.

The results of the field trials that year were so satisfactory that it was decided to extend the experiment the following season, an area of approximately 6 acres being cropped with the same varieties, while seed obtained from Queensland, Java, and Japan was also tried. Trials on new and old land, together with a ratoon crop, were also conducted, and a watering test was carried out.

The yields obtained in 1923–24 were :—

Wataribune	120 bushels per acre.
Caloro	110½ ,,
Colusa	87½ ,,

The yields of the other varieties could not be compared with the above. New land showed an increase of 25 bushels per acre above land previously cropped with rice, and over 50 bushels per acre above the ratoon crop, which was overrun by weeds. Although the areas used in the experimental crops were small, it could be seen from them that land and climatic conditions were suitable for rice-growing, and the yields obtained were a good indication that the crop could be grown profitably on a commercial basis, provided a suitable market could be found.

With the results of these trials as a guide, several of the settlers were desirous of trying out the crop on a commercial basis, and so the seed produced from the American varieties was supplied to six settlers.

In 1924 rice was sown for the first time commercially on the Murrumbidgee Irrigation Area, when 143 acres were cropped, and so commenced the rice-growing industry that now promises a great future. One farm on which 18 acres had been sown returned an average yield of 100 bushels per acre, and the average for the 143 acres was 65 bushels per acre. Consignments of " paddy " rice were forwarded to both Sydney and Melbourne for milling tests, the results of which showed that the quality was much superior to the imported article. Upon this information there appeared no doubt whatever that the locally-grown rice would find a ready market, and the Water Conservation and Irrigation Commission purchased all available rice on the Area

for seed supplies for intending growers for the following season. The price received was £13 8s. 3d. per ton, and the proposition of rice-growing looked good. It was at this period that the importance of the crop was first realised by the settlers and the inquiries which the milling firms of Sydney and Melbourne were making served to confirm the prospects of the crop.

In July, 1925, a meeting of intending growers was held at Leeton, when Mr. Bell, managing director of Robert Harper & Co. and representative for the other rice milling firms, addressed the settlers. He stated that his company, in conjunction with the other firms, was prepared to take the product of 2,000 acres the following season at £10 10s. per ton f.o.r., Sydney or Melbourne, which price was accepted. The price was later increased to £10 10s. per ton f.o.r. Leeton.

In 1925, 2,211 acres were sown to rice, the Commission having had to import 20 tons of seed from America to meet the demands. Over sixty settlers grew the crop, the areas ranging from 5 to 130 acres. Owing to a late winter the preparation of the land was delayed on most farms, and consequently late sowings were made, the majority of the crops not going in till late October. The conditions throughout the summer suited the crops, and some excellent yields were obtained. Wherever thorough preparation of the land had been carried out and the water carefully controlled splendid yields resulted.

Harvesting Troubles.

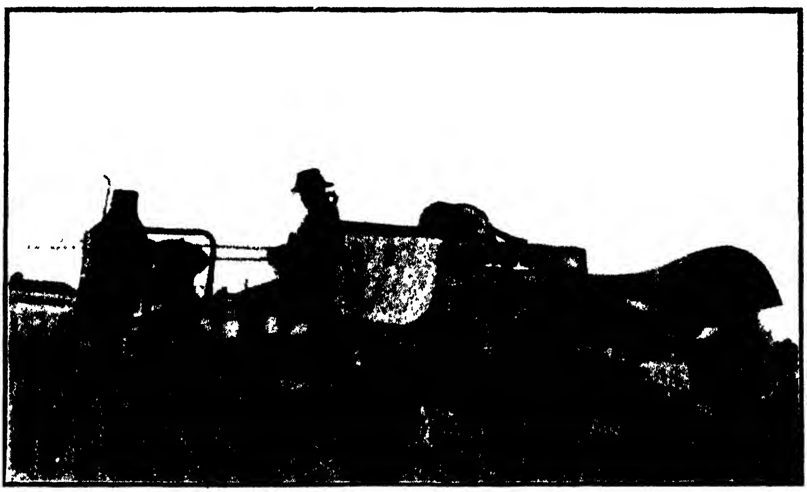
Harvesting has been a problem, and it is possible that trouble may be experienced any year from an early break in the weather, which will prevent the use of ordinary machinery. Although wet conditions handicapped harvesting operations to a large extent in the 1925–26 season, no damage was done to the standing crops. A loss of grain occurred wherever the binder was used in the late harvested crops, due to the overripe grain being easily knocked off. The risk of a wet harvest will be lessened by earlier sowings—as soon as danger of frost is over and the soil has commenced to warm being the best time.

The past harvesting season tried the growers out, but most of the difficulties have been overcome by auxiliary driven machinery, and the majority of the crops have now been harvested. Binding and threshing was the general method adopted, and to overcome wet conditions small 3½ horse-power engines were built on to the binders, the drive wheel then only being used to take the weight of the machine. A header, such as is ordinarily used for wheat, was tried out and after several alterations and the attaching of a 7 horse-power engine for auxiliary power, it handled a crop of 160 bushels per acre very successfully, despite adverse conditions. The auxiliary driven header seems to be the machine most suited for harvesting rice, as time is the main consideration once the grain is ripe. Although it is possible to cut with a binder a fortnight before a header could be used, the sheaves have to be stooked for

at least fourteen days, then carted, and either stacked or threshed. A considerable loss of grain occurs at each handling, whereas with the header the grain is ready for bagging in one operation. Beside the loss of grain and the chance of being caught by rain, binding and threshing is more expensive. The bagging of wet rice is to be avoided, as it is subject to mould and is then objected to by the millers. Caloro, being a soft-grained variety, is likely to hold more moisture, and so is more liable to be damaged in this way than either Colusa or Wataribune.

The Varieties.

Colusa is an early maturing variety bred in America, being about a week to ten days earlier than Caloro, and about a fortnight earlier than Wataribune. It yields best on new land, is a sparse stooler, and inclined to lodge on rich soil.



A Rice-harvesting Plant.

A wheat header was first tried without an engine drive, but without success. A 7-horse power oil engine was then mounted on a frame over the front wheel and with a few alterations it handled a 150-bushel crop excellently.

Caloro was bred from Wataribune and is the leading variety grown in California. It yields well on new and old land, stools well, heads out quickly and ripens evenly.

Wataribune, the late maturing variety, came originally from Japan. It is the best variety for old land, stools well, and is a good milling rice.

It is advisable to sow only pure seed, so as to have an even ripening of the grain, and the necessity for pure seed plots is becoming very evident.

The yields vary considerably, ranging from 40 to 140 bushels per acre, the heavier yields being the result of thorough preparation of the land. The best results will only be obtained from early and thoroughly prepared seed beds,

with good drainage facilities, and high and substantial check banks. The total yield for the area this year is estimated at between 2,000 and 2,500 tons, averaging about 70 bushels per acre.

The Cost of Production.

The manner in which the crops grew last year showed that soil and conditions were suitable for the production of good yields, but from a commercial point of view the cost of production had to be ascertained, and this was not possible till after harvesting. The heaviest yield was obtained from a 10-acre crop of Caloro, which averaged 144½ bushels per acre; in this case a record of all costs was kept. It must be considered that the cost of production depends to a large extent on the individual, and in this case all operations were thoroughly, yet economically, carried out. It must also be remembered that these figures are from the first year's growing of what may be termed a strange crop. The figures supplied are as follows:—

	£	s.	d.
Ploughing, at 10s. per acre ...	5	0	0
Cultivating, at 5s. per acre ...	2	10	0
Hire of check banker and labour of levelling ...	4	0	0
Harrowing, at 1s. per acre ...	0	10	0
70 chains check banking at 2s. 6d. per chain ..	7	0	0
23 chains ditching at 2s. per chain ...	2	17	6
Drilling, at 2s. per acre ...	1	0	0
Supervision during growing period at £1 per acre ...	10	0	0
Seed, at 16s. 8d. per acre ...	8	6	8
Water ...	9	10	0
Rent, at 7s.6d. per acre ...	3	15	0
Cutting and binding ...	5	0	0
Binder twine ...	0	7	6
Stacking, 2 men, 4 days, at 10s. per day ...	4	0	0
Wages during threshing ...	24	0	0
Bags, 416 at 10s. 2d. per dozen ...	17	7	0
Seaming twine ...	0	10	0
Power kerosene, 4½ cases at 16s. per case ..	3	12	0
Benzine, 1 tin ...	0	10	0
Tractor oil, 2 gallons ...	0	17	0
Carting to railway, 23 tons at 1s. ...	1	3	0
Interest on lien to Commission for seed ...	0	8	9
Cost of 10 acres ...	111	4	5
Cost per acre ...	11	2	6
Gross return per acre of 144½ bushels at £10 10s. per ton, or 3s. 11½d. per bushel ...	28	12	0
Net return per acre ...	£17	9	6

(Depreciation has not been considered.)

The cost of production can therefore be reckoned at about £9 to £11 per acre. In the second year the cost of check-banking, ditching, and several other costs would be considerably reduced, but against this the decrease in yield has to be considered, and after the second year the land will probably only carry one crop every two years.

The above returns are exceptionally high, and although it would hardly be fair to expect the same returns from, say, 100 acres, still it shows the possibilities of the crop. Sheep kept with the object of raising small lots of lambs should be a profitable mixed farming proposition in conjunction with rice. An area of not less than 500 acres would be required to enable 100 acres to be cropped each year and 100 acres fallowed for the following season. There will always be a certain amount of grain lost on the ground at harvesting, and this can be turned to profit by running pigs or turkeys on the stubble.

Weed growth, especially water grass or barn-yard grass, will be a serious problem within the next few years, and sheep should provide a means of keeping them under control. It will be unwise to crop the land for more than two years in succession, after which fallowing will be necessary, which will need working well, and probably watering several times to germinate the weed

A Crop of Watarlbune Rice.
This bay of 2 acres yielded 154 bushels per acre.

seeds, the growth from which can then be eaten off by the sheep. Good drainage facilities will be necessary, especially on farms without any high land, as trouble may be experienced with fluke and foot-rot in the sheep. Weed growth, particularly water grasses, can be largely controlled by early and deep submergence, but this will in no way lessen the necessity for early well-worked fallows.

Soil Problems.

Reports from America state that they find it practically impossible to grow other crops on land that has been under rice for a number of years, but with a mixed farming proposition of 500 acres or more, by not over cropping from the start and with systematic working, it should be possible to grow profitable fodder crops of wheat, oats, or barley.

With the continual submergence of the land for three or four months of the year the soil will have a tendency to become "washed out." A large percentage of fine soil particles, along with organic matter, &c., will be carried down

and deposited on the underlying clay band. The extensive and fibrous root system of the plants should have the effect of keeping the top few inches of soil loose and friable, especially on the heavier clay soils, and deep ploughings will be necessary to secure the best results. Heavy clay land appeared loamy in the top few inches after being cropped to rice, probably due to a large percentage of fine clay particles being washed down.

The Possibilities.

The total area of land suitable for rice growing on the Murrumbidgee Irrigation Area is approximately 79,000 acres, of which about 40,000 acres could be cropped. Allowing for half under fallow, it would leave 20,000 acres under crop each year, and as the irrigation scheme is only about one-third developed at present the acreage should increase as more land is thrown open for irrigation. Already applications have been received by the Commission from new intending rice growers for seed sufficient to sow 3,000 acres next season, and practically every grower of last season is increasing his acreage. At present the estimated area sown this season is between 7,000 and 8,000 acres.

The annual importation of rice into Australia is between 20,000 and 25,000 tons, and reckoning on a 60-bushel crop per acre as an average, 22,000 acres would be necessary to fulfil this demand, and would mean something like £250,000 to the Area, besides a revenue of £25,000 for railway freight. There is nothing to fear from over production, as once the local demands are met there is a ready market in the East, as well as in England and Germany. America first grew rice commercially in 1912, and having met her own demand is now exporting to European countries and also to Japan.

The estimated loss in dressing rice (from the paddy to the uncleaned stage is from 16 to 20 per cent. of the weight of rice. This, combined with ot' factors, will probably lead to the erection of mills on the area, so openi' a new field for employment. ges

The proportion of cleaned and polished commercial rice to pad lb. of from one-half to two-thirds. The approximate milling out turn ' paddy is:—

98 lb. commercial rice.
6 lb. polish.
28 lb. bran.
30 lb. hulls.

is valuable as stock
Rice bran contains a high percentage of protein ained it soon becomes
fodder, but owing to the excessive amount of fat which is sold for various
rancid. This is overcome by extracting the c'
uses, leaving the residue for stock.

Polish is chiefly used in America as -or dairy cows and pigs, having
great value as a concentrate. Eur milled rice has less flavour and
is of a lower nutritive value than O ntal rice, because in the latter countries

the polish is not removed from the kernel in milling. The polish contains about fifteen-sixteenths of the flavour of the grain. Hulls are at present valueless, but a market may develop for the straw, which, being extremely tough and soft, may be used for stock bedding and for packing.

A co-operative society has been formed for the marketing of the grain, and to safeguard the interests of the growers. To encourage local production it was recognised that a duty on imported rice was necessary, and as a result of the efforts of the Murrumbidgee Rice Growers' Co-operative Society Ltd. there is every possibility of future growers benefiting to the extent of a duty of 3s. 4d. per cental (100 lb.) on uncleaned rice, and 6s. per cental on other than uncleaned. At present uncleaned rice is allowed in duty free, whilst there is only a duty of 3s. per cental on cleaned rice.

During the past two years much interest has been centred on the rice crops and the returns and prospects have been closely studied. The important point about them is that they have been grown on the poorest classes of land and have given excellent results. Throughout the irrigation area there is a considerable amount of heavy clay land which has been a burden to both the settlers and the Commission, inasmuch as it has proved practically useless for crop growing. Experimental work on this class of land, such as methods of cultivation and irrigation, and the use of gypsum and artificial fertilisers, has been carried out in an endeavour to improve the soil and bring it to such a condition as would be suitable for profitable crop growth. Although increased returns have been obtained through some of the methods adopted, they proved too costly to justify general adoption, and were beyond the means of the majority of the settlers, and so the use that this land could be put to remained a serious problem. However, judging from the way the crops grown and from the yields obtained, rice seems to be the solution of this la[illegible], and promises a means of profitably utilising much of the unwanted [illegible] the Area.

THE REVOLUTION EFFECTED BY FARM MACHINERY.

THE most im[illegible]ive development of all time in agriculture comes with the advent of farm machinery. I wish I might paint for you something of the picture of revolu[illegible] that American farm machinery has brought in crop production. Could the farmer of Pharaoh's time have been suddenly reincarnated and set down in your grandfather's wheat field, he could have picked up the cradle scythe and [illegible] to work with the familiar tool at a perfectly familiar job. But then, in the space of twenty years, the method of crop production underwent gre[illegible] changes than they had in the previous five thousand years. At one stri[illegible] covered ground where fifty centuries had left almost no mark of progress [illegible]atever. Suffice to say that between 1880 and 1900 our production per work[illegible] engaged in agriculture rose about 25 per cent., and the total output of farm products increased nearly 70 per cent.—W. M. JARDINE, United States Secretary for Agriculture.

What Herd Testing Effected.

A North Coast Herd.

R. M. MARSH, Assistant Dairy Instructor.

The system of grade herd testing has now been in operation on the North Coast for the past fourteen years, although during the latter end of the war period most units ceased to exist.

The various testing associations up to 1923 were supervised by the Tweed-Richmond Herd Testing Council, when full control of all testing operations was taken over by the Department of Agriculture, at the request of the Council.

The testing movement has been moderately supported by North Coast farmers, and of late years it has gradually spread to other parts of the State. The increased support recently given the movement has been gratifying, but there are still many herds which have not been submitted for test. It is difficult to understand why so many farmers will not embrace this very reliable aid to increased butter production, and so bring about definite improvement in their herds. Many farmers contend that they can estimate the value of their cows without putting them under test, but their systems of judging, which are many and diverse, have been so often proved to be wrong that it is time the only system that makes no mistake was more widely adopted.

How herd testing can be made effective by increasing the butter production of each individual cow is the important problem that concerns those engaged in the dairying industry.

The effectiveness of any herd testing scheme depends mainly on—

(*a*) The soundness of the scheme;

(*b*) The efficiency of the testing officer;

(*c*) The feeding of the dairy herd;

(*d*) The use of pure-bred bulls of known high production strains;

(*e*) The application, by the farmer of the results or records obtained through testing.

The failure of any of these will interfere with the ultimate aims and objects of testing.

In order to place the scheme on a sound basis, the general rules governing the formation and operation of grade herd-testing units have been revised from time to time, and many improvements have been made since the inception of the scheme.

Testers are trained and their work is checked, and constant supervision is exercised over the whole organisation. The efficiency of the testers in the Tweed and Richmond districts of this State is undoubted, and they enjoy the full confidence of the farmers whose herds are undergoing test.

The use of pure-bred bulls of known high production strain is in the hands of the farmer, but, unfortunately, this aspect of increased production is not as widely followed as might be expected, although there is a growing tendency in this direction.

It is in the application of the test records that most farmers who have taken up herd testing have failed to derive the benefits they should. This is evidenced by the fact that so many farmers withdraw their herds from test at the completion of one or two years' operations. These short records can be utilised by a certain amount of culling and the selection of a few cows from which heifer calves may be reared, but nothing tangible by way of increased production is arrived at. This can only be achieved by testing, breeding, feeding, and culling over a period of years, and fixing some definite comparative standard of production, based on the yields of the best cows in the herd. This is also the only way in which a check can be kept on the herd sire, as to whether he is increasing or maintaining the production standard of the herd by his daughters' yields. The necessity for the "head of the herd" to be a pure-bred bull of known high production strain, and also the necessity of testing over a period of years, might best be illustrated by quoting the experience of a farmer in the Mullumbimby district:—

Testing was commenced on a herd of Ayrshire-Shorthorn grade cows in 1914, when a pure-bred Guernsey bull was introduced. The farm, no doubt, would be looked upon as being a good one, having a fair amount of flats with undulating and hilly country; the pasture was a mixture of paspalum and clover, and other feed was given during the period under review, consisting of cow cane, maize and sorghum, which were carted out into the paddock and fed in the stalk, when available. This method has been followed since 1914 up to the present time.

ANNUAL PRODUCTION of one North Coast Herd from 1914 to 1924:—

Year.	No. of Cows.	Yield per cow.	Highest Cow	Lowest Cow	Total Production of Herd.	Class of Season.
		lb. fat.	lb. fat.	lb. fat.	lb. fat.	
1915–15 ...	71	149	227	74	10,554	Good.
1915–16 ...	73	113	188	58	8,258	Very dry.
1916–17 ...	62	173	262	81	10,787	Good.
1917–18 } 1918–19 } ...			No testing carried out.			
1919–20 ...	59	166	......	......	9,794	Dry.
1920–21 ...	62	168	234	97	10,432	Moderate.
1921–22 ...	60	206	295	134	12,359	Good.
1922–23 ...	60	144	230	83	8,605	Very dry.
1923–24 ...			No testing carried out.			
1924–25 ...	53	235	320	159	12,476	Good.

The records show that in 1914–15, seventy-one cows yielded 152 lb. of butter-fat per cow, which was considerably above the average of dairy cow in New South Wales at that time and even to-day.

It will be seen from the table on the preceding page that, taking the good seasons by way of comparison (the herd being mainly fed on pasture), a gradual increase in production has been achieved—not only in the average yield per cow, but in the highest yielding and lowest yielding cows.

The increased production for the year 1924–25 over 1914–15 was equal to 2,315 lb. of commercial butter (1,922 lb. butter-fat) from eighteen fewer cows, which, at 1s. per lb., represents £116 added income with considerably less labour.

The average yield per cow increased by 86 lb. fat. The highest yielding cow increased by 93 lb. fat, and the lowest yielding cow increased by 85 lb. fat. The yield for the lowest cow in 1924–25 of 159 lb. fat was also in excess of the average yield for the herd in 1914–15 of 149 lb. Of the fifty-three cows milked in 1924–25, fifty were bred on the farm, the other three being purchased pure breds.

It is also interesting to note that this increase has taken place in two generations, for although eleven years have elapsed since the introduction of the pure-bred sire, the purchase of a bull on pedigree only in 1915, without reference to production, was attended by considerable misfortune, as although this young bull showed good type himself, his daughters were found to be lacking in constitution, and after being in the herd for three years he was disposed of with most of his progeny, which meant the loss of practically two generations.

The information in the second table illustrates the value of a pure-bred sire of high-production strain, and the part played by the test records of each of his progeny in arriving at his proper valuation. The records shown are those of the foundation cows in 1914–15, their daughters and grand-daughters :—

It will be seen that all the foundation cows shown in the above families have production records ranging from 158 to 207 lb. of butter-fat, which, under the conditions already stated, prove them to be considerably above the average dairy cow. The significance of the good bull is manifest in the systematic improvement in the production of the daughters and grand-daughters of these foundation cows, as one might hardly expect such marked increases in yields from the progeny of such high-yielding foundation cows.

The improvement is so marked, in fact, that it is worth adding that whereas the average production per head of these seven foundation cow was 183 lb. butter-fat, the average of the twelve daughters (one tested twice) was 226½ lb., and that of the seven grand-daughters was 235 lb. As the grand-daughters were only heifers when tested, it may be confidently expected they will all put up still better records.

YIELDS of Cows and their Progeny in North Coast Herd.

	Name.	Age.	lb. Butter-fat.	Year of Test.
Foundation cow	Lucky	...	158	1914–15
Daughter	Esme	7 years	239	1924–25
"	Stella	9 "	266	1924–25
Grand-daughter	Lucky ex Stella	4 "	249	1924–25
"	Dandy ex Stella	3 "	240	1924–25
Foundation cow	Darky	...	163	1914–15
Daughter	Bonny	6 years	203	1921–22
"	Gentle	6 "	236	1924–25
Grand-daughter	Myra ex Bonny	3 "	220	1924–25
Foundation Cow	Judy ...	..	173	1914–15
Daughter	Judy II	6 years	295	1921–22
Grand-daughter	Nancy	2 "	197	1924–25
Foundation cow	Charmer	...	184	1916–17
Daughter	Canary	5 years	223	1921–22
"	Charmer II ...	2 "	222	1925–26
Grand-daughter	Eva ex Canary	3 "	254	1924–25
Foundation cow	Dairymaid ...	...	200	1914–15
Daughter	Dairymaid II	6 years	206	1921–22
Grand-daughter	Dairymaid III	3 "	280	1924–25
Foundation cow	Pansy	..	207	1914–15
Daughter	Lady	5 years	225	1924–25
Grand-daughter	Lucy ..	3 "	207	1925–26
Foundation cow	Minnie	...	199	1916–17
Daughter	Barbara	5 years	216	1921–22
"	Flossie	5 "	226	1924–25
"	Minnie II	3 "	180	1924–25
"	"	4 "	187	1925–26

In conclusion, attention might be drawn to the fact that the methods adopted by the farmer in question are those within the reach of all dairymen.

The cattle were only pasture fed, except on those few occasions when, as previously mentioned, farm-grown fodder was given in addition. It is not intended to convey the impression that supplementary feeding is unnecessary, but rather the reverse, as a glance at the table of the annual production of this herd from 1914–15 to 1924–25 will show at once the falling-off of yields in the lean years as compared with the good seasons when the cows had full and plenty.

No permanent improvement of production would have been evidenced, however, without the careful selection of the herd sire, accompanied by systematic application of the information obtained from the test record sheets in the selection of the high-producing units of the milking herd and the culling of the low producers.

Potato Trials at Batlow.

SEASON 1925-26.

A. J. PINN, H.D.A., Special Agricultural Instructor.

DURING the past season variety and fertiliser trials were conducted on the farm of Mr. E. M. Herring, "Sheen," Batlow. The soil was the red basalt that is typical of the district. The land had previously grown potatoes, and had remained in clean fallow since the digging of the previous crop. It was ploughed on 12th October, 1925, disc-cultivated on 15th October, and again on the 27th, when it was also cross-harrowed. This preparation left the soil in good condition, and the moisture content was ample for the early requirements of the crop.

The variety trial was planted on 27th October and the manurial trial on the 28th, and the land was harrowed immediately after each half-day's planting.

The plot was again harrowed on 3rd November, and after interculti vation on 11th January no further cultivation was given, owing to the continued dry weather.

The rainfall during the period September to June was as follows:—

	Pts.		Pts.
October ...	267	April ...	281
November ...	343	May ...	318
December ...	16	June ...	532
January ...	164		———
February ...	657	Total ...	2,861
March ...	283		

There was a particularly dry period during November, December, January, and February, until the heavy rain storm at the end of that month. The dry period occurred during a critical period of growth, and a rather poor crop resulted. The autumn rains had the effect of producing second growth, and at digging time it was seen that a large proportion of the crop was second-growth tubers.

YIELD in Variety Trial.

	Yield per acre.			Seed potatoes in yield.
	t.	c.	q.	per cent.
Factor ...	3	2	2	41
Up-to-Date... ...	2	10	3	73
Coronation	1	12	2	71
Batlow Redsmooth ..	1	11	1	47
Batlow Beauty ...	1	7	0	63
Brownell's Beauty ...	1	5	1	37

It is worthy of note that the white skin varieties gave the highest yields, but the variety Up-to-Date produced a very large percentage of seed size tubers only.

Factor again demonstrated its suitability to the conditions of the district, even under adverse conditions. This variety has been a consistent yielder in past years, and local growers would do well to give greater consideration to it in preference to many of the varieties now under cultivation. Inquiries to hand recently from this district seem to indicate that Factor is much sought after for seed for this season's planting.

The variety Coronation, which has always been looked upon favourably, is henceforth likely to be little grown. Under adverse conditions it produces a large percentage of seed which is difficult to dispose of. On the other hand, should the season be so bad as to produce a big crop of seed in the variety Factor, no trouble would be found in disposing of the crop, providing it was dug sufficiently early to be available for the increasing demands made each year by coastal growers for this variety.

Batlow Redsnooth only proved a medium yielder, but tubers were attractive and of good quality. On the yields of this and previous seasons I would select this variety and Factor as two varieties worthy of greatest attention in the Batlow district.

YIELDS in Fertiliser Trial.

	Yield per acre.			Seed potatoes in yield.
	t.	c.	q.	per cent.
No manure ...	1	3	0	71
P1 at 2 cwt. 3 qr. 14 lb. per acre	1	5	2	81
P10 at 3¾ cwt per acre ...	1	7	1	74
Superphosphate at 5 cwt. per acre	1	8	2	77
Superphosphate at 2½ cwt. per acre	1	9	1	78
P2 at 2 cwt. 3 qr. 14 lb. per acre	1	14	0	71

The mixture P1 consists of 10 parts superphosphate and 1¼ parts sulphate of ammonia; P2 consists of 10 parts superphosphate and 1¼ parts sulphate of potash; P10 consists of 10 parts superphosphate, 1¼ parts sulphate of ammonia, and 1¼ parts sulphate of potash.

In this trial the variety used was Coronation. It is interesting to note that all fertilisers gave an increased yield over the unfertilised plot, and that the increased application of superphosphate resulted in a decreased yield over the standard application of 2½ cwt. per acre. The difference in yield of all plots is really too small to justify comment on the value of any particular fertiliser or mixture, and for the present local growers cannot do better than follow the results of previous years, which favour an application of 2½ cwt. of superphosphate per acre at planting time.

WIMMERA RYE GRASS AND WHEAT-FARMERS.

IN the opinion of the recent conference of Agricultural Instructors of the Department, Wimmera Rye grass can be safely recommended to wheat-farmers, with the precaution that, on farms where the land is not fallowed or where stock are not kept, particularly in the north-western districts, it is liable to become a pest.

Trial with Sweet Potatoes in the Metropolitan Area.

J. DOUGLASS, H.D.A., Agricultural Instructor.

WITH the increased attention that is being given to the growth of vegetables and their supply to Sydney and adjacent markets, work is being carried out by this Department in the metropolitan district for the improvement of the sweet potato crop.

The Sydney market largely depends on sweet potatoes grown in Queensland and on the northern rivers of New South Wales. This produce is generally not of good quality and usually reaches the market in a damaged condition, and the prices obtained are not as high as those given for the local article. Sweet potatoes are usually looked upon as a crop requiring a semi-tropical climate for maximum results, but the crop has been successfully grown on a small scale in the metropolitan area for a number of years and with improved methods of cultivation, better seed, and better varieties, large areas could be more profitably used.

Some time ago the Department of Agriculture introduced a number of new varieties of sweet potatoes from the United States, Queensland, and Hawaii, with the object of improving the yield and quality of the local product. These varieties have been tested out for a number of years on the far North Coast with marked results. Several varieties, particularly those from United States of America and Hawaii, out-yielded our own and possessed better culinary qualities. With the object of giving local growers an opportunity of testing and examining these varieties, trials were conducted at various centres.

The growing season just passed was rather unique in that the spring was a very late one and the summer exceptionally hot and dry. The seed potatoes were late in sprouting, with the result that cuttings and plants were not obtained until November. Only 368 points of rain fell during the period from November till mid-March, the result being that the plants made practically no growth over that period. Very good rain fell after mid-March, and this, with a prolonged autumn, enabled many of the roots to mature.

At Terrigal about 20 inches of rain fell in a few weeks, drowning many of the plants and making the trial practically valueless. The hot, dry weather considerably interfered with the yields on the sandy soils at Miranda. At Penrith the effect of the heavy rain was remarkable. The plants, which had been at a standstill for practically the whole of the summer, immediately started to make rapid growth. The roots formed up very quickly, absorbing large quantities of moisture, and producing cracks in the soil which had become compacted as a result of the heavy rains. The remarkable and rapid growth of the crop was largely due to the high soil temperature, and to the fact that the roots were just beginning

to thicken. The soil at Penrith is a second-class alluvial loam, which, with special care, is very suitable for the growing of sweet potatoes. Every attention was given to the experiment by Mr. J. Carter, who co-operated with the Department of Agriculture in conducting the trial.

Cultural Details.

The land on which this trial was conducted had previously been cropped with French beans, which had been manured with superphosphate at 2 cwt. per acre. The residue of the crop had been ploughed in during the autumn, and the land well fallowed over the winter. At planting time the soil was in excellent tilth and contained abundance of moisture. The planting of the experiment was carried out by hand on 7th December, 1925; the plants were spaced 2 feet apart in rows 3 feet apart. Practically a perfect stand was obtained, very few cuttings having to be replanted, entirely owing to the moisture conserved in the soil during the winter fallow. Providing a good start is first obtained, the resistant qualities shown by this crop to long spells of dry weather are remarkable.

The dry weather had the tendency to force the roots down to lower levels seeking moisture, the result being that the long-rooted varieties produced tubers of exceptional length. These varieties were difficult to harvest, owing to the risk of breaking the roots. The rainfall during the growing period was as follows:—

	Pts.		Pts.
1925.		1926.	
December	182	April	170
1926.		May	192
January	170	To June 9th	114
February	16		
March	876	Total	1,720

YIELDS.

	t.	c.	q.	lb.		t.	c.	q.	lb.
Pierson	11	5	3	16	Porto Rico	7	5	1	12
Yellow Strasburg	10	16	0	8	Farmer's Special	6	17	2	0
Southern Queen	10	12	2	2	Vitamine	6	17	2	0
Nancy Hall	8	12	3	12	Boyne River	4	14	1	24
Director	8	6	3	24	White Maltese	4	2	0	2
Brook's Gem	8	5	0	0					

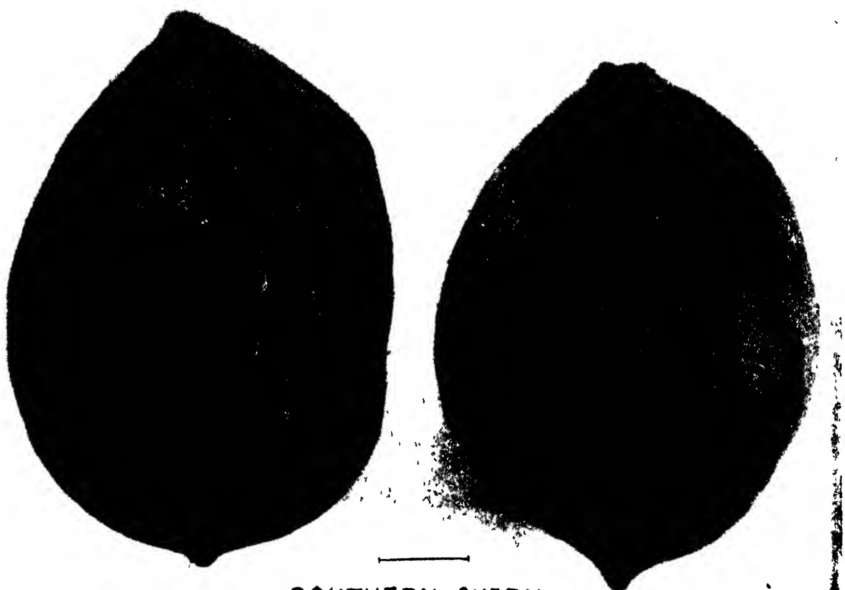
From the results obtained it is recommended that Yellow Strasburg, Southern Queen, Pierson, and Nancy Hall be planted in the metropolitan area in the place of Pink and White Maltese, which are at present most extensively grown.

In normal years it is very doubtful if sweet potato cuttings transplanted during December will give the same results as in this experiment. The high soil temperature and the prolonged autumn enabled the crop to mature. In a normal year all growth would have been stopped during late April by cold weather, or by frosts destroying the top growth.

An effort should be made to transplant in the early spring when the soil has warmed up and all danger of frost is over. Seed sweet potatoes can be forced during the late winter by planting in hot-beds and frames prepared with stable manure and protected from frosts.

Notes on Varieties.

Nancy Hall.—This variety was imported from the United States of America. It is an early maturing sort, a strong grower, and has yielded well in all trials. The tubers are cream to pink in colour with light-yellow flesh, and of medium to large size. The tuber belongs to the chunky type and tapers at both ends. The size of the tubers can be reduced in fertile soils without reducing the yield by planting close. The leaves are dark-green in colour, large, round, and slightly toothed; the veins are green in colour. A big advantage in this variety is that the stems are only of medium length and do not root at the joints; this facilitates the cutting away of the plants before digging. The stems are round in shape, thick, green in colour, with the young growth slightly purple. The cooking



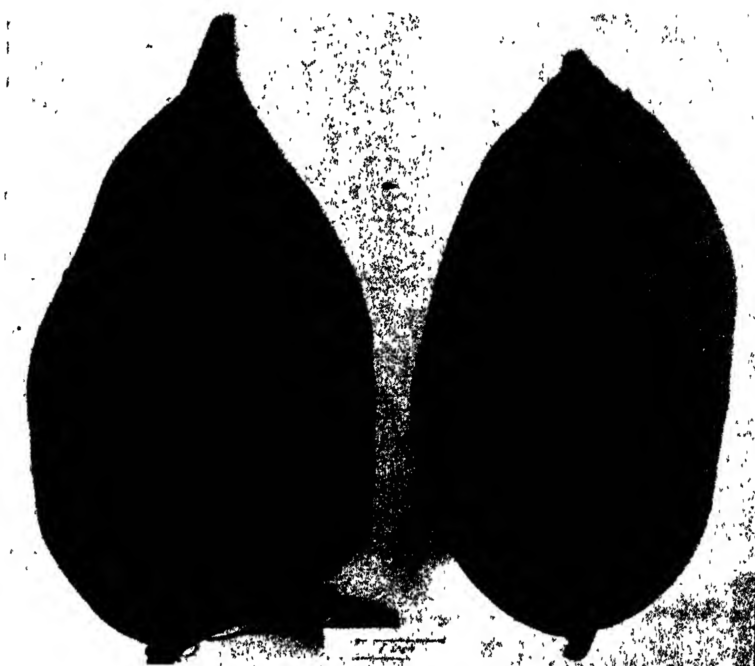
SOUTHERN QUEEN

quality of this variety is good. The tubers are reported to be good keepers, and should be useful for storing and keeping in light soils. A noticeable feature of this variety is the robust growth made throughout the dry spell, and the excellent germination made in the seed-beds. This variety should become very popular on the Sydney market when better known.

Southern Queen.—This variety was also imported from the United States and has been a consistent yielder under local conditions. The vines of this variety are round in shape and medium to long in length. The leaves are pointed, of medium size, and have green veins. The tubers are of the chunky type, the smaller ones being nearly spherical in shape. They are inclined to be on the large size, but in medium-class soils roots of a medium

and uniform size are produced. The surface of this variety is inclined to be ridged, which is a distinct disadvantage. As a cooker it is inclined to be on the coarse side, but it is reputed to improve when kept. The skin is white or green in colour and the flesh cream. An experiment conducted in the United States indicated that Southern Queen is the best keeping variety.

Yellow Strasburg.—Originally coming from the States, this variety has been grown for some time on the North Coast of New South Wales with good results. Its culinary qualities are excellent; it cooks dry, and very sweet. The vines are round in shape, slightly purple in colour, and long.



YELLOW STRASSBURG

The leaves are pointed, light-green in colour with green veins. Owing to the abnormal season the shape of the roots varied from long oval to pear shape; they were, however, all of good medium size. The roots are cream in colour, with yellow flesh.

Pierson.—This being a consistenly good yielder, we have been working on it for some time. Its two main disadvantages are that it is a late maturer and the vines have a tendency to root at the joints. This rooting tendency of the stem increases the cost of harvesting, and spreads the bulbous roots over a greater area than in the cluster variety. The vines are of medium length, and the leaves are large, dark-green, pointed, and distinctly toothed. The veins of the leaves are purple. In normal years

the roots are a fairly good shape, but the dry weather experienced last summer produced roots of a medium long shape. The roots are light cream in colour with white flesh; the skin has a tendency to blacken and crack in wet weather.

Keeping Qualities.

As the keeping qualities of sweet potatoes are a very important feature it was decided to take particular notice of the varieties stored during the winter, and some notes on the behaviour of the different varieties will assist growers to come to a decision as to the most suitable time to dig, and also the amount of seed required to be saved, allowing for decay, &c.

Pierson.—A good keeper; skin inclined to discolour with storage.

Yellow Strasburg.—An excellent keeper, practically no decay.

Southern Queen.—An excellent keeper. Owing to the shape of the roots very little mechanical injury was noticeable.

Nancy Hall.—This variety proved to be the best keeper, and should be a very suitable type for growers who make a practice of leaving the root in the soil until a suitable price is obtainable.

Director.—Only a fair keeper.

Brook's Gem.—Only a fair keeper.

Porto Rico.—This variety proved to be a bad keeper under local conditions, but this may have been due to the cracking of the roots, brought about by seasonal influences. Further tests are desirable.

Farmer's Special.—A very fair keeper.

Vitamine.—Kept very well; worthy of further trial.

Control of White Ants.

In the August issue of the *Agricultural Gazette,* page 619, Mr. W. le Gay Brereton described a method adopted in certain orchards for the control of white ants in fruit trees. The Government Entomologist, Mr. W. B. Gurney, supplements the paragraph by suggesting the sweetening of the bait by the incorporation of molasses, and painting the mixture on small pine boards which should be nailed together, the treated surfaces facing one another in the form of a sandwich.

The bait recommended is made up by heating and mixing 4½ lb. molasses or treacle, and 1¼ lb. of sugar, and then adding ¼ lb. of sodium arsenite dissolved in half a pint of boiling water. The whole should be stirred while hot, until thoroughly mixed, and then allowed to cool.

This makes a sticky bait, which is extremely poisonous, and which can be used in the control of white ants generally in buildings, a small quantity being inserted in various places into the runways and workings in infested boards, and covered by nailing another board over it so that the bait is hidden.

A pamphlet on the subject of white ants and their control will be available shortly.

Paspalum Renovation Trials.

J. N. WHITTET, H.D.A., Agrostologist.

THE outstanding feature of trials conducted on several farms on the North Coast in the past few months has been the superiority of ploughed paspalum areas over unploughed. The feed on areas which were ploughed last autumn has been distinctly fresher and more palatable to the stock than the untreated pasture. This fact is evidenced in the preference shown

A Paspalum Paddock that was Ploughed last April.

The manner in which this part of the paddock has been eaten down, compared with the part illustrated in the next photograph, indicates how palatable the new growth was to the cattle. The photograph was taken on 17th August, 1926.

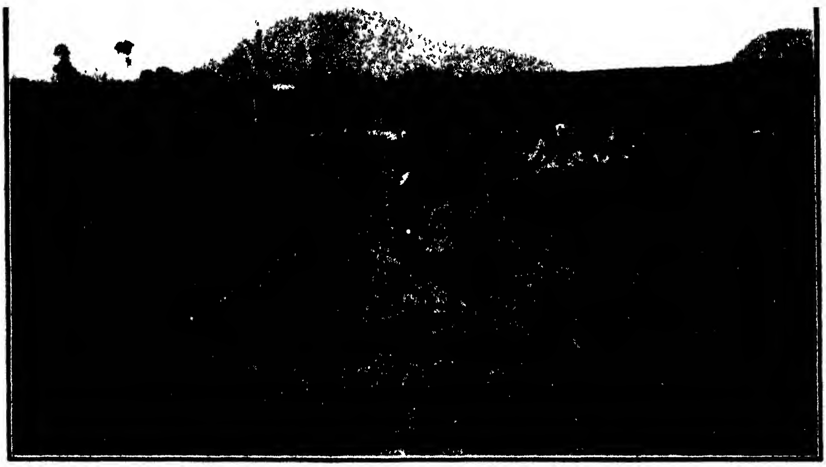
by stock for the grass growing on the ploughed sections, it being cropped close to the ground, whereas adjacent unploughed areas are practically neglected by the animals, principally on account of the paspalum being somewhat dry, harsh, and unpalatable.

The two accompanying photographs were taken on the farm of Mr. W. R. Isaacs, Murwillumbah, where a positive illustration of this nature occurred. One half of the paddock was ploughed and the other was not. The effect can be gathered by a comparison of the two pictures.

In the manurial trials on the heavier types of yellow clay country a mixture of 2 cwt. superphosphate and ½ cwt. of sulphate of ammonia per acre has given the best results. Areas where it is impossible to plough, and which were top-dressed with this mixture two years ago, still continue to produce greater growth than unmanured sections. It has been found that the best time to top-dress paspalum pastures is during the spring.

Ploughing should be carried out during the autumn, and farmers are advised to scatter seed of the following mixture of clovers and winter grasses on these ploughed areas:—Wimmera Rye 2 lb., Italian Rye 2 lb., Perennial Rye 2 lb., Cocksfoot 2 lb., Tall Fescue 2 lb., Subterranean clover 1 lb., White clover 1 lb., and Sheep's Burnet 1 lb. per acre. These plants will provide feed during the period that the paspalum is dormant, and will persist in the pasture for some years.

Where it is impossible to plough, broadcast the following mixture among the paspalum during the late autumn:—Wimmera Rye 3 lb., Italian Rye 2 lb., Subterranean clover 2 lb., White clover 1 lb., and Sheep's Burnet 2 lb. per acre.



Portion of the same Paddock that was not Ploughed.

The cows have practically neglected the unploughed portion of the paddock. This photograph was also taken on 17th August, 1926.

Kikuyu grass stood the winter and dry weather on the North Coast better than paspalum, and farmers are advised to make plantings of Kikuyu during September or October. Roots are obtainable from Wollongbar and Grafton Experiment Farms and Hawkesbury Agricultural College. Farmers who have tried this grass speak highly of its carrying capacity and milk-producing qualities.

Infectious Diseases Reported in August.

The following outbreaks of the more important infectious diseases were reported during the month of August, 1926:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	16
Piroplasmosis (tick fever)...	Nil.
Swine Fever...	Nil.
Blackleg	4

—Max Henry, Chief Veterinary Surgeon.

The Peanut.

[Continued from page 619.]

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor,
and G. NICHOLSON, H.D.A., Experimentalist, Grafton Experiment Farm.

Varieties.

PEANUT varieties may be divided into two distinct groups, namely, runner and bunch types. The runner or spreading type rarely exceeds 9 inches in height, the plants being of a procumbent habit. Given favourable soil and climatic conditions, they may spread to a distance of 5 feet. In most cases they are late maturers. The nuts are borne almost out to the end of the procumbent stems. This feature has its disadvantages, as it makes cultivation, harvesting, and thrashing more difficult and costly. As a general rule the runner types are good yielders of both nuts and forage, and on this account are in favour for feeding-off purposes. On heavy types of soil and under favourable weather conditions they produce a large number of "pops" (shells which lack a kernel or contain only an immature kernel), and do not bear so well as some of the bunch types.

The bunch types are upright bushy plants, growing from 12 to 30 inches high, with a spread of about the same extent. The nuts are borne closely clustered around the tap root. This feature permits of closer planting, and easier cultivation and harvesting. Usually they are much earlier maturing than the runners, and the nuts are of better quality and contain a greater percentage of kernels. Under adverse conditions they will fill much better than the runner types.

There are a large number of varieties, but only a few are of any commercial importance. Many varieties are unsuitable on account of poor yield and quality, or failure for some other reason to conform with market requirements. For confectionery purposes the trade requires a nut that shells a high percentage of kernels, with a light-coloured testa (skin).

For the roasted peanut trade (roasted in shells)—clean, bright, large, and uniform nuts, with thin shells and pale kernels, preferably those that contain large, well-developed kernels, are required. While it is easily possible to produce a good class of nut, suitable for the confectionery trade, on red and black soils, nuts for the roasting trade must be grown on light-coloured soils, so that the shell shall be free from soil particles and present a clean, bright appearance. The majority of varieties bearing large kernels shell a lower percentage of kernels than the White Spanish types. While this feature is to a certain degree objectionable, it is not of very great importance when catering for the roasted peanut trade, the main object being to produce clean, well-filled nuts of good size.

Java White Spanish or Large White Spanish.—This is the largest of the White Spanish types; the seed came originally from Java. It was the principal variety grown throughout New South Wales during 1925-26.

Although it closely resembles the other White Spanish types in growth, it is not difficult to distinguish it from them. The plants are of an erect habit of growth, about 2 or 2½ feet high, with a spread of about the same extent. The foliage is abundant, and the leaves are fairly large, but not quite as large as in the other Spanish types. The nuts are borne closely clustered around the tap root, and when harvested do not easily break away from the plants. When mature, the nuts have a tendency to sprout readily if the soil is moist, and for this reason it is necessary that harvesting be not unduly delayed. The nuts are larger than the other Spanish types, and generally contain two, but sometimes three, well-developed, pale-coloured kernels. In comparison with the medium and small Spanish varieties, the kernels are larger, and not so tightly packed in the shells, and the kernel percentage is a little lower.

White Spanish Peanuts.
Five acres of this variety were harvested on the farm of Mr. S. See, Carr's Creek, Clarence River, May, 1920.

Small White Spanish.—Since the advent of the above-mentioned varieties, this variety is not of much significance. Although it shells well, the kernels are somewhat too small in comparison with the Java or medium White Spanish to suit the confectionery trade. The nuts are much smaller and usually contain two kernels, though in a poor crop many nuts have only one. All the Spanish varieties are somewhat earlier in maturing than the other varieties of peanuts.

Red Spanish.—In habit of growth this variety is very similar to the White Spanish type, and when grown side by side in the field they appear to be identical. The nuts are a little larger and the shelling percentage is below that of Small White Spanish. The main difference, however, is the colour of the seed coat (skin or testa) that covers the kernels. As the name implies, the seed coat of Red Spanish is dark-red in colour, while that of

the White Spanish type is of a pale pink or brownish colour. Red Spanish are not in demand to the same extent as the pale-skin types, manufacturers mostly preferring pale-coloured kernels.

Medium White Spanish.—This variety is of American origin, and is intermediate in size between the Java and the small White Spanish varieties. The growth is somewhat larger than that of the Java, and the foliage rather lighter in colour with somewhat larger leaves. The nuts and the kernels are also smaller, and the kernel percentage is higher than in the Java White Spanish. Both these varieties are in demand by the confectionery trade, but the Java type is liked better on account of the larger kernels.

A Plant of White Spanish Variety.

Valencia.—This variety attains a height of 18 to 30 inches, is of semi-erect habit of growth, and has coarse stems which are inclined to be loose and open, giving the plant an appearance of lack of foliage. The foliage, though scattered, is fairly abundant; the leaves are large and dark-green in colour. The pods are borne in close proximity to the base of the plant; they do not adhere firmly to the vines when pulled up, and if allowed to stay in the ground when mature they sprout readily. They are of medium diameter and long, and contain three to four bright red small

kernels, closely crowded together. The shells are thick and smooth, and form from 40 to 45 per cent. of the total weight. The small size and the colour of the kernels preclude them from being greatly in demand for roasting or confectionery purposes.

White China.—This variety is mostly of a running habit of growth. The plants are vigorous growers, and produce an abundance of dark-green foliage. The nuts are large, and generally contain two long, large pale-coloured kernels. It is a late maturer and requires good soil and climatic conditions and a longer growing period than the White Spanish types. On account of its size, smooth shells, and well-developed pale-coloured kernels, it is in demand for roasting purposes. The main essentials in a roasting nut are that the shell shall be bright and unstained, and free from particles of dirt, and the percentage of pops low. To conform with these requirements it is necessary that they be grown only on fertile friable

Virginia Bunch Variety.

light-coloured soils. There is still a fairly good demand for nuts for the roasting trade, and so far there has not been found any more suitable variety than White China. On account of the great difficulty in harvesting on account of its running habit, it is doubtful whether it will ever be much grown locally. It may be possible to breed a bunch type from it, but until the harvesting difficulty is overcome, this nut is most likely to be imported from China.

Virginia Runner and Virginia Bunch.—Apart from the different habits of top growth, these two varieties resemble each other very closely. Both are strong, vigorous growers, and produce an abundance of medium dark green foliage. The nuts are fairly smooth, of medium size, and good shape, and generally contain two well-developed pale-coloured kernels. As they are fairly late in maturing, they require to be planted early in the season.

These nuts are valued by confectioners mainly on account of their excellent flavour, and they are used extensively for blending with other varieties in the manufacture of peanut butter. They are used to some extent for roasting, but on account of the high percentage of hull they are not very popular. They are also well liked in the confectionery trade for sugar-coating on account of the large even size of the kernels.

Diseases and Insect Pests.

Wilt (*Sclerotinia* sp.).—The majority of peanuts grown on the Clarence during the 1925-26 season were attacked by a fungus disease, belonging to the *Sclerotinia* group. In most instances the attack was only of a light nature, while in a few cases practically the whole crop was affected. Seasonal conditions appeared to favour the development of the disease, the season under review being one of those in which sporadic outbreaks are prevalent in many crops. It was noticed that the attack was greater on areas planted with imported seed and sown late. Local strains of peanuts

The Effects of Sclerotina Disease.
The plant on the left is healthy, and that on the right badly attacked. They adjoined one another in the same crop.

planted early in the season were practically free from infection. One or two imported varieties, the seed of which appeared to be perfectly healthy and normal, were infected to such a degree that the whole crop was destroyed. This tends to show that one of the primary sources of infection is the seed. Seeing that this disease is capable of causing serious loss, greater care must be taken in the future to keep it in check by obtaining supplies of seed from sources known to be clean.

The first outward indication of infection in the field is the premature yellowing of the leaves which wilt very rapidly, turn black, and become very brittle. The stems become black and eventually the whole plant collapses and dies. Under normal conditions the leaves of the peanut vine as it reaches maturity turn yellow and drop off. As a rule, unless strong winds prevail, plants attacked by *Sclerotinia* do not drop their leaves; the leaves adhere to the stems, wither up and gradually crumble away. The first point of attack is at the base of the plant (ground level). The cells become clogged, the sap ceases to flow, and the plant tissues commence to

rot. In advanced cases of infection the tops will break away from the roots. This has at times been attributed to damage from grubs, but upon closer examination it will generally be found that the stem has completely rotted away. The disease results in premature ripening of the crop. Plants attacked when nearing maturity or those that show some signs of resistance to the disease, are capable of producing a fair crop of apparently sound nuts. Owing to premature ripening, however, many of these nuts may germinate, and are therefore lost before the remainder of the crop is in a fit condition to harvest. If a diseased plant be pulled up it will be noted that the nuts break away very easily from the pegs or flower stalks. Upon examination the shells will be found to be covered with a dense greyish mould, and the kernels are generally affected, being shrivelled or covered with moulds, and in the advanced stages are merely a slimy mass. Infected plants invariably produce a large percentage of pops. Badly-infected nuts have been found on apparently healthy and vigorous plants. If these plants are allowed to remain in the ground for any length of time the nuts germinate and as infection increases they eventually wither and die off.

The moulds found on the shells and kernels are due to the presence of myriads of spores. These spores are capable of going through a number of changes, and when moisture and temperature conditions are favourable they germinate and infect the growing crop. The fungus can live saprophytically in the soil for a number of years, and, owing to the fact that it attacks a large range of host plants, is somewhat difficult to control. Spores may be carried over from one year to another through the seed. Under such circumstances it will readily be seen that only sound seed from healthy plants and clean land should be used.

Peanuts should not be grown on the same land two years in succession, or infection through the soil is likely to occur, though apart from this consideration it is inadvisable to grow peanuts on the same ground year after year. Where possible all diseased plants should be gathered up and destroyed by burning, for if such nuts are allowed to decay in the ground the fungus spores will be carried over until moisture and temperature conditions are favourable to germination, when they will infect the following crop. The presence of large quantities of organic matter will favour the spread of the disease, since it provides a host for the fungus to live in a saprophytic state. Sound seed, good drainage, efficient cultivation, fallowing, and the growing of crops that permit of inter-cultivation, such as maize or sorghum, will do much to reduce the loss in the field.

The other diseases attacking peanuts in New South Wales are a leaf spot caused by the fungus *Cercospora personata*, and rosette disease.

Plants attacked by the first-mentioned disease develop on their leaves numerous circular dark-brown spots. Wet seasons, low and poorly-drained soils, and late planting are conditions favourable to the development of the trouble. So far leaf spot has not been responsible for any serious damage, and it is of insufficient importance to warrant the app[illegible] of control measures.

As a general rule, rosette disease only attacks the vines late in the season when they are nearing maturity. When infection takes place at an early stage of growth, the plants remain stunted and rosetted, but if the disease attacks the plant later, the ends of the branches develop into rounded masses of short shoots and dwarfed leaves. The disease is probably caused by an infective virus (like "bunchy top" of bananas), and it has been proved that it can be transmitted from affected to healthy plants by aphis. Conditions preventing the normal development of the plant, such as excessive rain, drought, or unfavourable soil conditions, apparently favour the disease. No definite control measures are known, but early planting and good cultural methods will do much to minimise infection. Rosette disease is of minor importance, only appearing occasionally, generally when adverse conditions prevail.

In New South Wales the peanut is remarkably free on the whole from any serious insect pests, the only ones that have been observed attacking this crop to any extent being the cutworm, Yellow Maize moth, and Pink Maize moth. By practising correct methods of cultivation it is possible effectively to curtail the ravages of the cutworm. The larvæ of both the Yellow and Pink Maize moths have been found attacking the kernels. Infestation takes place while the vines are curing in the field or during storage waiting to be thrashed. In the majority of cases the grubs are found attacking only those nuts which have split pods. Splitting of the shell is due to the nuts being allowed to remain in the ground after reaching maturity. It is not thought that these insects will do any serious damage, but in cases where they are plentiful, harvesting at the correct time, early thrashing and bagging of the nuts should do much to keep them in control.

(*To be Continued.*)

What is Wanted for Weed Control.

The discussions which have centred around weed control have been many and animated, but while the talk has gone on the weeds have established themselves. Despite all the talking, it is doubtful whether any definite policy has been formulated in regard to control. Certainly none has ever been put into operation. If there ever has been any such policy it has been that of letting a plant thoroughly establish itself as a weed and then declaring it noxious. . . . . Whether the present system is allowed to continue or not, it is very desirable that some central authority should be set up which would bring about a common policy in dealing with established weeds, and which would have the power to carry out investigations in regard to weeds generally. It would also be the duty of such an authority to go on to any land in any part of the State and destroy any plant which is noxious or is likely to become so. Such powers, if exercised particularly in regard to new plants, should save us from weeds which have not yet become established. The method should not prove costly, as such an authority would have no difficulty in securing the active co-operation throughout the State of all who are interested in the control of weeds.—A. H. E. McDonald, Superintendent of Agriculture, at the State Agricultural Bureau Conference.

"Dust" Fumigating Citrus Trees.

A Grower's Experiences and Suggestions.

W. H. BROWN, Editor of Publications.

The serious losses sustained by citrus-growers in coastal districts in the last few years, in consequence of the spread of red scale (*Aspidiotus aurantii*), have resulted in something of a revolution in the methods by which the pest is attacked, and perchance controlled. Since fumigation was first introduced to the notice of growers by the Department of Agriculture in 1899, it has always been regarded as a sort of classic method of dealing with scale insects on citrus trees. At first it was fairly extensively practised, but, except in the case of a few owners of large orchards who have consistently fumigated for years, it fell almost into disuse during the war and immediately post-war period owing to the high cost of the materials.

In the early years of the present decade, however, there was a regular invasion of many citrus districts by red scale, which was observed to increase rapidly, season by season—so rapidly, in fact, that some better method of control than spraying with miscible oils and washing soda became absolutely imperative. On the soldier settlements at Kurrajong, for instance, spraying was carried out most thoroughly in the seasons 1923 and 1924; yet in June 1923, the monthly bulletin circulated by the Returned Soldier Settlement Branch of the Lands Department among the settlers recorded that "spraying has done good work, but it has not nearly extinguished the scourge," and in April, 1924, although "practically all the blocks on the settlement have been sprayed for red scale, the results can only be called fair," while a month later the manager, Mr. W. S. Arnold, wrote that "another year's experience points out that spraying is not as effective as it could be wished. A certain percentage of kill has been obtained. but better results are necessary. Fumigation must be resorted to, even though the cost will be about 6d. per tree in three-year-old orchards."

Nor was failure to control the scale the only limitation of the spraying method. It was observed that it often caused damage to foliage and young fruit, notwithstanding that the orchard had been most carefully and thoroughly cultivated with a view to ensuring for the trees sufficient vigour to resist the influence of the spray. Moreover, the indifferent kill sometimes obtained, even where all the surrounding conditions were favourable, rendered second sprayings necessary, with further serious injury to the trees.

During the 1924 season one of the soldier settlers close to Sterculia, Mr. H. E. Ewins, decided to try fumigation on a few trees. He was one of those who had sprayed most conscientiously, and had actually hired a power sprayer with the hope of doing more effective work, but sufficient scale still escaped to re-infect the orchard at once. Indeed, it is re-infection that constitutes the main trouble with red scale. So rapidly does this insect multiply that a 70 per cent. kill is of little value, the remaining specimens

breeding up and re-infesting the trees in a few weeks. What is required therefore is a treatment that will give a thoroughly good "kill." The results on the few trees fumigated by Mr. Ewins in 1924 were so outstanding that he had no difficulty in deciding it was a far more effective treatment than spraying, but the re-infection from surrounding trees indicated that the real solution of the problem lay in the direction of fumigation of the whole block. That first trial was with what is known as "pot fumigation," but the damage to the tent material made it so expensive, to say nothing of the danger of severe burns on hands and clothes, that a trial of "dust fumigation" was arranged. The results were so favourable to the latter method, on the grounds of both economy and convenience, that the old pot system was dropped at once, and, so far as the Kurrajong district is concerned, it has disappeared, as, indeed, it has done in other districts. Some

Fig. 1.—Fumigation or Spray?

The tree in the foreground was fumigated in June, 1924, being then the worst scale-infested tree in the orchard. The tree behind, in 1924 was about the healthiest, and it was sprayed—not fumigated. Nine months later (March, 1925) tree No. 1 was the healthier, denser, and more profitable of the two.

trouble has been met with in the "dust fumigation" of lemons, but experience has suggested certain lines of procedure, to which reference will be made later on.

The Season 1925.

The year 1925 came in with still further evidences of scale activity all over the settlement. By February and March the infestation was so bad that it was locally described as a "dust storm," and many orchards were soon in a deplorable condition, the work of several years seeming to be undone in a few weeks. At this stage Mr. Arnold visited inland irrigation citrus districts in New South Wales, Victoria, and South Australia, and in the last two States in particular learned that fumigation had been so effective against the same scale that hardly any scale was to be found in the citrus groves there. He returned thoroughly convinced that the Kurrajong settlers must look to the same method of control for relief.

Mr. Ewins proceeded with the fumigation of his whole block in the early months of 1925, and followed that up at once by a similar treatment of the orchard of his neighbour, Mr. F. B. Mackenzie, some of whose trees were then in a very bad way. The recovery of these trees (situated close to the main road and the object of continual remark by passers-by) created the greatest interest, and must have been a factor in leading the Department of Lands to offer to fumigate the settlers' orchards on terms particularly welcome to men whose labours of years appeared likely to be swept away.

It was of obvious importance that if a large number of trees were to be fumigated they should be within a defined area, so that the risk of re-infection from non-treated areas might be minimised. Twelve soldier

Fig. 2.—A Closer View.

This was the tree that in June, 1924, was healthy, vigorous, and apparently clean. In March, 1925, red scale had made it scraggy and unattractive.

settlers were accordingly found whose 12,000 trees were practically in adjoining blocks, and a contract was made with Messrs. Ewins and Mackenzie to fumigate the whole lot at 7d. per tree, the Department paying for the work and recovering from the settlers on extended terms.

So satisfactory was the result of that year's operations that in January, 1926, the Lands Department made a fresh contract with the same partners for the fumigation of an additional 19,000 trees. By this time the effects of the treatment on the trees fumigated in 1925 were so apparent that many private growers in the district were letting contracts for similar work in their orchards, and in addition to those treated on the settlements at least 30,000 trees have been fumigated in the present year by various contractors.

In the course of work covering two clear seasons and involving the treatment of many thousands of trees Mr. Ewins has acquired a knowledge of some points about fumigation that will interest growers, and in a recent conversation he was good enough to state his experience for the benefit of the citrus-growers of the State.

How Particular Trees have Fared.

The accompanying illustrations, Figs. 1 and 2, show two trees which have exactly reversed their relative positions as to growth and vigour in consequence of different treatments for red scale. In 1924, No. 1 tree, then the smaller and less promising of two four-year-old trees, was fumigated, while No. 2 was sprayed. In the ensuing months No. 1 made rapid progress, and, assisted by fumigation again in 1925, made up into a growthy, vigorous tree, which in 1926 carried a profitable crop of clean, good quality fruit. No. 2 (sprayed in 1924) was so badly infested with scale in 1925 that a pin point could hardly be put down on a clean area, and much wood had to be cut away as useless. Though fumigated in 1925, it is now the smaller tree of the two, is deficient in wood, not so dense as No. 1, and in the present season carried less than half a crop. "If you put the cost at 7d. per tree," said Mr. Ewins, "it surely pays to fumigate." As he walks round his orchard to-day this grower points to the denseness, the healthy colour, and the promise of next crop on those trees that have been fumigated three times. In all respects they look more thrifty and progressive than those that have only been fumigated twice.

"There is a tree that should be carrying a case of fruit, but there is not one on it—due to the loss of wood by scale attack two years back. It is not uncommon for it to take a tree two years to recover from a bad infestation. To get a clean tree you must fumigate a second time, and to get a clean orchard you can never rest altogether, for individual trees will require attention every year." And Mr. Arnold, who was present, added, "Spot fumigation will always be necessary."

When in 1925 attention was given by Mr. Ewins and others at Kurrajong to calcium cyanide as a fumigant, that product was already attracting attention, but it had been thought the humidity in coastal areas would be against its use there. The trials—conducted during periods of humidity which varied up to 80 per cent.—were therefore watched with much interest.

The Strength of the Dosage.

At first Professor Quayle's table of dosages was accepted, but very soon it was found that if the quantities of potassium cyanide mentioned in Mr. W. J. Allen's No. 2 table were read as quantities of calcium cyanide the results were still quite good. This economy in material reduced the cost of "dust fumigation" to the same, or very nearly the same, as the older system. Some further economy may yet be effected in this respect, but the opinion is growing that for badly infested trees that are being fumigated for the first time the dosage will have to be slightly increased. Where the conditions were really favourable Mr. Ewins would not be afraid to increase the dosage by 100 per cent., and if the grower could afford the money it would be well spent.

It is worth remarking that in experiments conducted by the Department at Wyong, Kurrajong, and Dural, with various dosages of calcium cyanide,

after the use of the strength mentioned in the Allen No. 2 Table no more than 1·5 per cent, of live scale could be found in any case on leaves and fruit.

It is one of the recommendations of fumigation that an overdose of the cyanide gas will do a tree less harm than an overdose with spray. Moreover, the treatment can be repeated within a short time without damage, whereas early repetition of spraying is apt to do serious damage. Mr. Arnold relates a case in which the same tree was fumigated three times in six months and did not suffer. Thus trees on which a good kill has not been obtained, or which have become re-infested, can be treated again.

Fig. 2.—The Effects of too heavy Dosage.

As a result of fumigation on 13th July, 1925, all lemon trees in this orchard were denuded of leaves and fruit. This tree was pruned back to bare limbs and spurs a few days after fumigation. The photograph on the right shows the same tree on 4th February, 1926.

When to Fumigate.

A good deal of experience has been acquired by Messrs. Ewins and Mackenzie as to the conditions favourable to successful fumigation, and it has been found that there are differences between those suitable for "dust fumigation" and those suitable for "pot fumigation."

The time of the year favoured for "pot fumigation" has always been January to April, those months being selected because many of the insects are then young and tender and least protected, and because any scale on the young fruit are killed and the scales are forced off as the fruit grows. Temperatures in excess of 75 deg. Fah. Mr. Ewins has most carefully avoided, and hence in the months mentioned above the work is done at night. On cool, overcast days, when there is no likelihood of the sun coming out, it may be safe even in those months, but should the sun emerge from behind the clouds work must cease at once or the trees will suffer. Toward the end of May it should be safe to adopt day fumigation generally, though even then days when the thermometer exceeds 75 deg. must be avoided. Work may go on right through the winter till, say, August, if desired.

It has long been accepted that fumigation by the pot method should not proceed if the soil is dry and the tree weakened by dry conditions, but Mr. Ewins' experience is that droughty conditions are not unfavourable for dust fumigation. Similarly there is no need to be greatly exercised about the humidity of the atmosphere so long as it remains below dew point. On occasions this grower has worked with the moisture content of the air as high as 80 per cent. On the other hand, damp conditions, such as dewy evenings and mornings, should be avoided. It has been found that if dew starts to fall it is advisable to stop work at once No doubt it is annoying to find, after starting at 6 p.m. with the intention of going on till, say, 2 a.m., that dew is falling at 9 o'clock, but if the work is proceeded with under those conditions a heavy defoliation is likely, and possibly also loss of fruit.

Admittedly defoliation is apt to follow in the case of a tree weakened by a serious infestation, especially if the weather has been a bit humid, but the loss may not be as serious as it looks, for the leaves are already devitalised and are likely to fall any way at any time. Speaking broadly, it may be said that, providing the fall of the leaves has not been due to the dosage being too strong, and if the direct rays of the sun are not so strong as to damage the main limbs, defoliation need not be a matter of concern, because in such cases the tree—being relieved of the scale as the prime cause of its condition—will begin to make up at once.

Some Hints about Treating the Lemon.

The lemon has been found a little more difficult to handle than other classes of citrus fruits, and the surrounding conditions have to be more carefully regarded. If the soil is wet and the humidity is high damage may be done to the tree, and particularly to the fruit and young growth, if the calcium cyanide is introduced under the tent by the blower in the ordinary way. On the other hand, it has been found that if the calcium cyanide dust is spread evenly over the soil under the tent damage may be avoided and a good kill obtained. The reason for the phenomena is not known, but the opinion has been formed by Mr. Ewins that if the dust is deposited on fruit and tender foliage at a time when the moisture content of the atmosphere is high, the chemical reaction damages the surface, or leaves a deposit that has the same effect.

The results obtained by dusting the calcium cyanide by hand under the tree have been rather variable, due perhaps to the distribution over the soil under the tent not being so evenly done as is desirable. Throwing the dust in by means of a scoop with a circular movement has not been successful, and even throwing it in from both sides has not been much better. Mr. Ewins' experience suggests that in treating lemons under the conditions described the calcium cyanide should be spread thinly and evenly all over the ground under the tent, that about 50 per cent. extra over the Allen No. 2 table should be used, and that the tent may be left over the tree a bit

longer than usual—say an hour instead of forty-five minutes. And "don't be too long under the tent yourself," for the dust begins to give off its highly poisonous gas at once.

It is not wise to continue to fumigate any class of trees in a strong wind, for the wind has a tendency to force the gas under the tent toward the leeward side of the tent, so that the scale on half of the tree may hardly be affected.

Damage is sometimes done by the tent getting damp and picking up soil, which acts like sand-paper to the delicate surface of growing fruit, especially lemons, breaking the skin and permitting the gas to cause burning. If the fruit is quite young, the injury is often repaired during growth, but precautions should be taken against the tent material getting wet.

Fig. 4.—The Same Tree Pruned.
After the right hand photograph in Fig. 3 was taken the tree was pruned again the same day. The condition of the tree and the prunings can be seen in this picture.

A Fumigation Outfit.

The cost of a fumigation outfit necessarily depends on the size of the trees to be treated. For growing trees it is well to get tents large enough for two or three years ahead—thus in buying tents for six-year-old trees it is well to buy them large enough for trees eight or nine years old. The material should not be too heavy, and yet of close texture—in other words, a calico of average good quality. On this basis, a tent large enough to cover a tree about 9 feet or 10 feet high will cost about £4 15s.

A mechanical fan is used for blowing the calcium cyanide under the tent. The one used by Mr. Ewins is of comparatively simple construction. can easily be transported from tree to tree by two men, and cost £22 10s. To-day similar but improved machines are worth about £15 10s. The only other outlay is for calcium cyanide, the price of which is £7 per 100 lb. in canisters of 25 lb. each, or £6 per 100 lb. in drums, at which figures the "dust" works out at less than 1½d. per oz. The contract rate

recently current for fumigation work in the Kurrajong and Windsor districts is 7d. per tree, which at 100 trees per acre would mean a little under £3 per acre for this item.

The Organisation.

The number of men required to carry out fumigation with greatest efficiency and economy depends primarily on the size of the trees. Mr. Ewins has found that where the trees are small two men can handle the equipment quite well, but with larger trees three men may be required to get the greatest efficiency from men and material.

Where two men are at work the piece of rubber hose conveying the calcium cyanide into the tent is first put in position, being placed alongside the butt of the tree, pointing upward, and the tent is then thrown over the

Fig. 5.—An Outfit of Tents at Work.

tree. With a little practice two men can quite conveniently cover a tree 7 feet 6 inches high without the aid of poles. It should next be the duty of one man to see that the skirt of the tent is well down on the ground all round. The tent material may easily be caught round a lower branch and the fact escape notice if the skirt is not well drawn out all round. Weeds also may prevent the skirt from resting on the ground if attention is not given to the matter. If the wind is strong enough to lift the tent material, soil must be thrown on to the skirt to keep it down, though, as already stated, if the wind is really strong work should be suspended altogether.

The tent should hang loosely over the tree, and not be drawn tight anywhere, so that the gas may have access to all parts. Where leaves are pressed firmly against the tent, or against one another, insects may be protected from the gas and not be killed, and the manner in which they breed up again and spread—effecting what is known as "back-infection"—is truly surprising. The tent being now in position, the man who has been attending to it will proceed to remove the tent from the tree that has been fully fumigated and to move it to the place where it will next be wanted.

Meantime the other man should be measuring up the tree that has been covered, taking the height and diameter with a measuring stick, weighing out the correct dosage, and putting it in the hopper of the blower, from which a few turns of the handle will force it along the hose and distribute it through the tree.

On these lines the work will proceed with speed in part determined by the size of the tree, the nature of the country, and the condition of the soil. At night the pace will be slower than in the day, especially if the soil surface is cloddy and rough. The number of tents than can be operated by a gang will depend on the size of the trees and the lay-out of the orchard. On four to five-year-old trees of average growth a gang of two men will require up to thirty tents.

When larger trees are being treated it may be necessary to employ two men to handle the tents, while a third measures out the dosage and operates the blower. In this case the men on the tents will require to use poles, and one of them will ascertain the size of the tree while the other pulls the skirt of the tent well out all the way round. For ten-year-old trees of average size about twenty-five tents will be required to keep three men going.

If Mr. Ewins were asked for a last word, it would doubtless be that too much must not be expected from the first treatment. A kill of 100 per cent. is often looked for, but it does not matter how well the work is done, one fumigation will not be completely effective, and it must be expected that a second treatment will be required in the following season. To get a clean tree it must be treated for at least two seasons, and to get a clean orchard the tent must always be available for the treatment of individual trees that become re-infested.

In Favour of Goats.

It is not suggested that goats, either milch or Angora, should take the place of sheep or cattle, but that they would prove very profitable if run in conjunction, or on land and under conditions where it is not at present practicable or profitable to run other stock. On rough scrub country, as weed destroyers, and in the interior, goats prove their merit in a capacity which other stock are unable to do.

For suburban or country town residents who desire to have their own source of milk supply, goats will be found to fill that need, especially when conditions will not allow of a cow being kept. Goats can be tethered where desired, and so it is not necessary to have the land fenced, but water should be provided and a large box for shelter from wind, rain, and the sun. In this way they can be used to clean the ground as needed, there would be very little food wasted, and no risk of the animal becoming a nuisance to neighbours. The value of the milk will more than pay the cost of feed and attention needed.—E. F. Lane, at the State Conference of the Agricultural Bureau.

Viticultural Notes for October.

In the current month, the season's spraying for the prevention of downy mildew can be commenced. The subsoil in practically all localities experienced a thorough wetting during the winter months, and if it should happen that spring and summer are marked by good falls of rain downy mildew is bound to make its appearance. So the course of safety requires that vine growers shall make a start with spraying this month, and follow on with periodical sprayings as the growth of the vines continues.

Provided that the setting is normal and the summer months not excessively wet, the State's vineyards generally should look forward to a good vintage. It is many years since the subsoil had such a beneficial soaking, particularly on the Hunter areas, and with good cultivation the soil moisture should be well conserved. The second or spring ploughing ought to be well advanced ere this, if not finished, and to avoid the setting of clods in soils of stiff nature, the harrows should follow directly after the plough. This will facilitate future cultivation and save the horses' shoulders and feet from undue wear and tear.

Late grafting will be proceeded with this month, and if vines show signs of bleeding too freely they can be cut back a few days prior to grafting. Resistant stocks of mature age and size are not satisfactory to graft, and one would be well advised to uproot such vines and replant rather than attempt field-grafting them.—H. L. Manuel, Viticultural Expert.

"Farm Measurements."

This book, as its title suggests, is intended to give a thorough and practical training in problems of mensuration arising during the course of farming operations. It is written mainly for students in agricultural colleges and schools, but the practical side has not been forgotten, and this book will therefore be of use to those actually engaged in rural pursuits. The use of logarithms, measurement of length, area, height, timber, and volume, and the calculation of levels, building materials, water-work, power, and so forth are all fully treated together with a good deal more. The book is written by lecturers in agricultural economics at the University of Leeds.

Published by University Tutorial Press Ltd., London.

A Point in Farm Book-keeping.

There is a decided difference of opinion as to whether the ordinary live stock on the farm should be valued in accordance with the fluctuations of the market or at a uniform figure consistent with age and quality. The former method shows the value that would be realised if the stock were sold; but even in a time of inflated prices they cannot be disposed of, as they are required for carrying on the farm operations. In such cases, the method may show profits which are not actually secured, while during a period of low prices, it may indicate losses that are not really sustained. Valuation at a regular, conservative price per head is on this account to be preferred, and on definite disposal the true loss or gain can be ascertained.

Green Fodder for Poultry.

Awards in a Competition at Miranda.

J. DOUGLASS, H.D.A., Agricultural Instructor.*

THIS competition was organised by the Miranda Agricultural Bureau with the object of encouraging members (who are principally poultry-farmers) to improve the quality and supply of green fodder for their birds.

A scale of points was drawn up in which due consideration was given to continuity of supply, quality and suitability of fodder, evenness and growth, set out of crop, cultivation, and range of crops grown. When allotting points, the number of stock carried and the natural conveniences of each farm were considered. Four quarterly inspections were made, the last one being carried out during 9th and 12th July, 1926. The competition was interesting in that the district was seen at a very dry period, and during a winter which has been one of the best on record.

As indicated above, one of the requirements in this competition was a constant supply of fodder, and it is interesting to note that in this respect two competitors, Messrs. Bye and Thacker, scored very consistently throughout. Many farmers paid little attention to variation of the fodder, some keeping solely to lucerne. This is not to be commended, as under even the best of conditions the most satisfactory results are not to be obtained on one crop. The aim when varying the fodder should be to have just two or three crops to supplement the lucerne, and to avoid having a large number in at one time. Because of its high protein content and food value, lucerne must always be considered the main item. Although the soil of this district is sandy and poor, remarkable crops of lucerne are obtained if sown in rows 2 feet 6 inches apart and top-dressed with manure. Owing to the mild winter this crop grows all the year round, though the growth during the winter months is slow. Maize is the crop next in importance, and it can be grown for eight months of the year. A series of plantings can be arranged. Maximum results will be obtained by sowing the grain thickly in rows 3 feet apart. During the winter months Mulga oats and Thew and Florence wheat, with vetches or field peas, give abundance of fodder of the correct type. For winter feed a fodder with a comparatively low moisture content is needed, the best form of which is found in the winter cereals. Kale (Thousand Headed), a crop which is not grown very extensively, gives remarkable results under all conditions. This crop is a perennial, and if treated well in the early stages will produce a fair supply of fodder consistently over a long period. Kale, rape, and cabbage belong to the "Crucifer" family, and are reputed to have certain medicinal qualities. They are all excellent green fodders.

Rape is usually sown in the young stock pens, to ensure a constant supply of this fodder. If this system is to be carried out a mixture of mustard

* With the permission of the Minister for Agriculture, Mr. Douglass acted in the capacity of judge.

and rape might be used. It has been suggested that Subterranean clover be used for this purpose, as it would ensure a more constant supply of fodder of a superior nature. This clover also produces abundance of seed, which would produce another crop the following winter.

During the summer small lots of Hungarian millet could be sown; this crop grows quickly, and produces a long seed head. This type of fodder is very nourishing and most valuable for young stock, and at the same time it reduces the feed bill. The residues from vegetable gardens are used for green fodder, and are found to be very suitable. Lettuce is extensively grown for chicken feed, but the small yield obtained and the trouble and care involved in cultivation make this crop very expensive.

Wind-breaks of tree lucerne afford good shelter, and produce a little green picking when other crops are drying off. This plant also makes nice hedges and lends finish to a property. Pigeon pea—a little-known legume, several varieties of which are grown on the North Coast—could also be grown for the same purposes, with the advantage that the seed provides a little feed of high value.

If growers keep these crops constantly in mind and arrange sowings at suitable times, ample green fodder of a most suitable nature will be provided all the year round.

TABLE of Awards.

Competitor.	First Quarter (points).*							Second Quarter (points).							Third Quarter (points).							Fourth Quarter (points).							Total Points for Competition.
	Cultivation.	Set out of Crop.	Evenness and Growth.	Suitability and Quality.	Continuity of Supply.	Range of Crops.†	Total.	Cultivation.	Set out of Crop.	Evenness and Growth.	Suitability and Quality.	Continuity of Supply.	Range of Crops.†	Total.	Cultivation.	Set out of Crop.	Evenness and Growth.	Suitability and Quality.	Continuity of Supply.	Range of Crops.†	Total.	Cultivation.	Set out of Crop.	Evenness and Growth.	Suitability and Quality.	Continuity of Supply.	Range of Crops.†	Total.	
Maximum pts...	25	10	10	15	25	15	—	15	10	10	25	25	15	—	15	10	10	25	25	15	—	15	10	10	25	25	15	—	—
J. Scott	15	8	7	13	9	13	65	7	10	3	12	4	5	41	7	9	6½	24	24	7½	78	8	9	7	22	24	9	79	263
G. Benn	16	9	7	11	14	9	66	13	8	6	16	13	6	62	14	9	6½	24	24	12	89	14	9	8	24	25	14	94	311
E. Thacker......	20	9	9	13	17	8	76	14	9	9	22	20	6	80	10	9	9	21	23	10	82	8	9	8	20	23	4	72	310
R. N. Russel ...	16	8	8	13	16	8	69	13	8	8	22	22	5	78	11	8	9	23	23	6	80	7	8	9	24	25	7	80	307
—. Davies	22	9	4	7	16	5	63	13	9	9	24	25	7	87	13	9	9	22	25	12	90	12	9	9	24	25	9	88	328
—. Marsh	18	5	7	10	5	5	50	12	4	4	15	5	3	43	14	6	9	20	15	13	77	12	5	9	20	13	7	66	236
R. A. Phillips	20	7	5	12	3	5	52	9	9	9	10	2	5	44	9	9	8	12	6	6	50	9	9	8	13	6	5	50	196
—. Burton ...	16	9	8	13	20	6	72	9	10	5	12	20	3	59	10	9	9	23	25	8	84	13	9	9	23	25	7	86	301
—. Bye	18	9	8	14	21	1	71	9	9	9	20	23	2	72	9	9	7	22	24	0	71	9	9	8	22	24	1	72	287
L. Green.........	18	8	8	14	23	0	71	18	9	6	21	23	2	77	13	8	9	23	23	3	79	10	9	9	24	24	7	83	310
—. Luxton ..	16	8	6	10	10	5	55	7	6	12	6	10	8	49	6	7	23	7	24	12	79	5	7	22	6	25	10	75	258

* Between the first and second quarters the scale of points was subjected to slight revision.

† This does not necessarily mean a large number of crops, but rather a judicious planting of various crops to ensure a suitable change in each season.

The Winners.

The first three places in the competition were occupied as follows:—Mr. Davies (328 points), 1; Mr. G. Benn (311 points), 2; Mr. E. Thacker and Mr. Green (each 310 points), 3.

Mr. Davies, the winner, is a very successful poultry-farmer, and has fully realised the importance of a good supply of green fodder. This grower scored very consistently in the points allotted for quantity, and suitability of fodder. A fairly large area was devoted to lucerne grown in rows, and throughout the whole test it was kept in perfect order. Mr. Davies also grew rape, oats, kale, wheat, and cowpeas. Tree lucerne surrounds many of the poultry pens, beautifying the surroundings and providing ample protection and shade for the stock.

Mr. G. Benn has only gone in for poultry-farming seriously during the last few years and pays a good deal of attention to green fodders. This competitor had the best selection seen during the competition. Although the number of crops grown by him was rather limited, he arranged always to have one or two crops coming in to combine with the lucerne. This competitor also arranged his crops so as to be handy to the buildings. and had each crop nicely arranged in fairly compact plots with a minimum amount of waste room.

The interest shown in this competition by newcomers to the district operating on a small scale was very encouraging. The soil and water supply are very poor, and the eagerness of these farmers to overcome the natural disadvantages and establish cultivated areas was noted with satisfaction by the Department.

"Mechanisms."

Of text-books dealing with the part of applied mechanics commonly called "mechanisms" there are several, but these deal with the subject almost exclusively from the theoretical standpoint, and require a rather advanced knowledge of the subject. The present book, written by a one-time lecturer in the engineering department of Leeds University, is an effort to outline this subject in a classified manner (yet without adhesion to orthodoxy), attempting to explain in more ordinary language the principles involved in the leading types of mechanism, and to illustrate these principles by descriptions of modern machines which incorporate them.

The book represents an appreciation of the need for a less complicated expression of the subject and is therefore welcome.

Published by University Tutorial Press Ltd., London.

To Promote Horse Breeding.

To encourage and promote horse breeding on proper lines Government supervision of stallions is necessary. All stallions should undergo strict veterinary examination, and those unsuccessful in securing a certificate of soundness should be gelded. Horses successful in passing the test should be registered. . . In the past horse breeding in this State has been of an indiscriminate nature, mostly from nondescript stallions. We are now paying the price for past neglect. Every farmer should breed sufficient horses to replace his old worn-out animals. If he breeds and keeps his teams young by selling geldings at five or six years old, breeding will pay handsomely. —M. L. Kingdon, at the State Agricultural Bureau Conference.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

***Maize* :—**

Fitzroy	L. Waters, Yarramalong.
	F. W. Hill, "Willow Vale," Yarramalong.
	R. W. Hindmarsh, "Wiaraga," Bellingen.
Leaming	Manager, Experiment Farm, Grafton.
Ulmarra Whitecap	R. W. Hindmarsh, "Wiaraga," Bellingen.
Funk's Yellow Dent	N. C. Pyemont, Moondarra, Gundagai.

***Broom Millet* :—**

White Italian	W. Lye, Loomberah.

***Sudan Grass* :—**

Manager, Experiment Farm, Cowra.

***Sweet Sorghums* :—**

Collier	Manager, Experiment Farm, Grafton.
No. 61	Manager, Experiment Farm, Grafton.

***Japanese Millet* :—**

Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society and Secretary.		Date.	Society and Secretary.		Date.
Millthorpe (T. P. Smith)	Oct.	19, 20	Lismore (H. Pritchard)	Nov.	16, 17, 18
Griffith (M. E. Sellin)	,,	19, 20	Murwillumbah (T. M. Kennedy)	,,	24, 25
Deniliquin (P. Fagan) .. .	,,	19, 20	Coramba (H. E. Hindmarsh) ..	,,	30, Dec. 1

1927.

Dapto (E. G. Coghlan)	Jan.	14, 15	Moss Vale (W. Holt)	March	3, 4, 5
Kiama (G. A. Somerville) ..	,,	25, 26	Glen Innes (G. A. Priest)	,,	8, 9, 10
Wollongong (W. J. Cochrane) ..	,,	27, 28, 29	Bangalow (W. H. Reading) ..	,,	9, 10
Bellingen (F. Reynolds)	Feb.	3, 4, 5	Taree (R. Plummer) .. .	,,	9, 10, 11
Tahmoor (E. S. Key)	,,	11, 12	Cumnock (K. J. Abernethy) ..	,,	16
Wyong (H. Brown)	,,	11, 12	Kempsey (N. W. Cameron) ..	,,	23, 24, 25
Newcastle (E. J. Dann)	,,	15 to 19	Campbelltown (W. N. Rudd) ..	,,	25, 26
Pambula (L. K. Longhurst) ..	,,	16, 17	Molong (W. P. Stanger)	,,	29, 30
Rydal (H. Murray)	,,	18, 19	Orange (G. L. Williams)	,,	29, 30, 31
Gunning (G. E. Ardill)	,,	22, 23	Camden (G. V. Sidman)	,,	31, Apl. 1, 2
Oberon (F. B. Packer)	,,	24, 25	Sydney Royal (G. C. Somerville)	April	11 to 20
Robertson (H. T. Carrick) ..	,,	25, 26	Forster (W. Poppenhagen) ..	,,	29, 30
Blacktown (J. McMurtrie) ..	,,	25, 26	Grafton (L. C. Lawson)	May	4, 5, 6, 7
Bega ( )	March	2, 3	Dungog (W. H. Green)	,,	11, 12, 13
West Maitland (M. A. Brown) ..	,,	2 to 5			

Pecan Nuts.

W. J. ALLEN.

THIS nut is of American origin and a member of the hickory family. The hickory, which in early days was found in Canadian forests, more particularly in Ontario, is not classed among edible nuts, though the timber is equal to that of the pecan, which is to be found mostly in the middle and southern States of America.

A few seedling pecan nuts have been growing in this State for many years, but the few which are cropping only produce small to medium sized nuts. Some years ago the Department imported some of the worked American varieties, and a few of the nuts of different varieties, photographs of which appear on next page, show the actual size of the nuts. Those who have tasted these delicious nuts consider them to be among the best for commercial purposes.

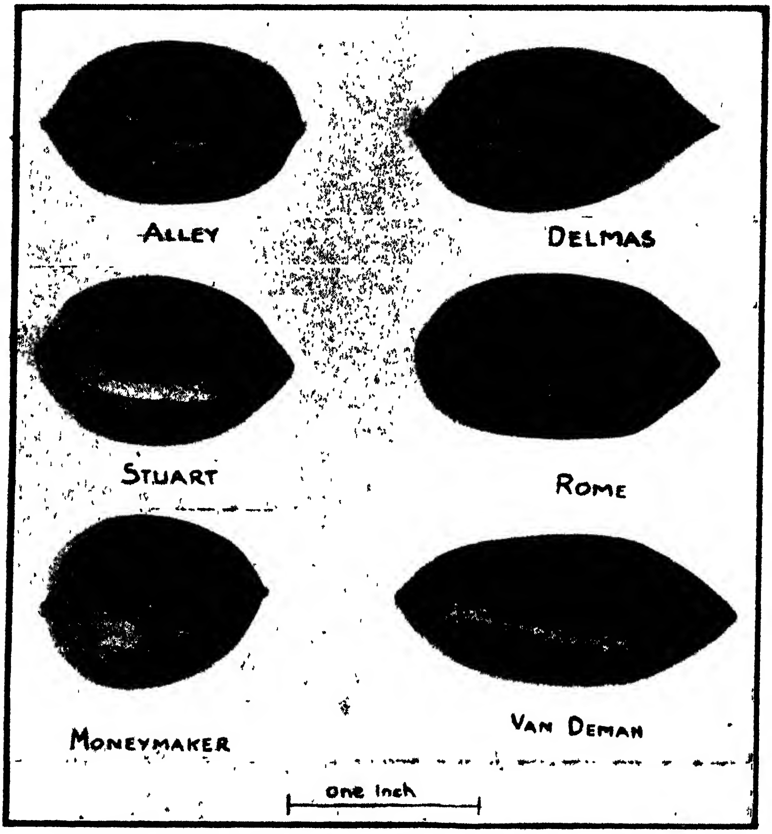
The pecan nut tree grows to a goodly size, and some have attained a height of 60 feet. It may be grown on any type of good soil where there is a good average rainfall. I have seen trees in America growing as far north as Ohio and Iowa, where snow and heavy frosts are quite common in winter, but I would prefer to recommend planting it on the deeper and lighter soils along the coast from Bega to the Queensland border, where the rainfall averages from 30 to 40 inches per annum. At Wollongbar, where the rainfall is about 60 inches per annum, the trees are showing up well, as also at Grafton Experiment Farm, but they are too young yet to say whether they will be profitable commercially. There are a few fairly old seedling trees cropping at Gosford State Nursery, and a large one at Grafton which is cropping.

At Narara Viticultural Nursery, where the Department is carrying out experiments with imported trees and with trees raised from stud nuts, the trees are doing well on the more loamy soil—much better, in fact, than where they have been planted on the stiff clayey soil, of which about half the nursery consists. The trees were planted fairly close together, but for general planting I would recommend from 28 to 36 feet apart, according to the nature of the soil.

It is trusted that before long the Department will be able to supply several hundred trees per annum, and when once a few thousand have been planted, no doubt nurserymen will undertake propagation as soon as a good supply of budding and grafting wood is available.

The best time to plant is in June or early July, and plants with good long roots are preferable. All the plants imported by the Department have had such roots, and it is recommended that in digging young stock similar roots be left on them. In removing the plants from nursery to plantation

be careful to protect the roots from wind and sun, and allow as little time as possible to elapse before replanting, as in the event of the young plants becoming at all dry there may be some difficulty in starting them, and they may only make weak growth.



Some of the Better Known Varieties of Pecan Nuts.

Where the trees receive good cultivation they do much better than where only a small square of land is worked around them, but I am inclined to think that after they become established in the best and deepest soil they would not require such careful attention.

Trees in suitable soil and localities begin to crop after from eight to ten years. In America good crops are harvested at times from trees of such age, but we have no data as to what may be expected in this country or whether they will prove a commercial crop, but, judging from the seedlings which are bearing, the outlook is hopeful. The large one at Grafton mentioned above is a seedling; as far as I am aware it is the oldest pecan nut tree in the State.

Poultry Notes.

October, 1926.

JAMES HADLINGTON, Poultry Expert.

The peak of egg production will now have been reached, and it is not too much to say that in respect of the volume of production all the prophets have been confounded. It has been predicted on all hands that owing to the depletion of flocks, first by excessive heat and later by forced sale of hens due to high cost of feeding, that there would by now be very many fewer hens to lay eggs. Contrary, however, to expectations there appears to have been a greater rather than a lesser volume of production, and notwithstanding the fact that there is now no great quantity of eggs in shell coming into Sydney from other States, it looks (at the time of writing) as if some thousands of cases more eggs will be exported than was the case last year.

This goes to show that notwithstanding all the troubles that in recent years have afflicted the poultry industry a steady expansion is still taking place.

Unfortunately a somewhat disquieting feature is looming ahead. This is in relation to the size and quality of the eggs being produced. That there has been a sharp falling off in these respects from attained standards is generally agreed to by all who are intimately associated with the egg trade. And since it is generally acknowledged that the future of our industry is dependent upon export, it behoves us to make every endeavour to improve the quality of the eggs produced.

In last month's notes the matter of "grades" and "grading" was brought under notice, and it is pleasing to note that there has been a noticeable improvement in the grading of a large number of consignors.

There are now no less than six floors where packing for export is being carried on, and the Department is issuing certificates of quality covering large quantities—a matter of some 25,000 cases which have already been shipped. In the course of the inspections, the writer, as certifying officer, comes in contact with the produce of some 2,000 poultry farms, and therefore is in a position to gauge the strength and the weaknesses of the industry in regard to the quality of eggs being produced. Apart altogether from the question of proper grading, which is within the immediate control of all farmers, there is the greater one of quality in its fuller sense. It is with this phase of the question that I now propose to deal.

Poor Eggs.

It is quite a seasonal occurrence to find some falling off in quality of shell, and to some extent in size of eggs towards the end of the year, following the flush laying period, but when (as is the case now and was during the whole of the month of September) there are coming on to the packing floors a very large percentage of thin, porous, and generally defectively shelled eggs, there must be some general cause operating to produce them.

It may not be generally known that the fundamental cause of poor shells (apart, of course, from lack of grit, which is a matter of management) is a low state of health and stamina in the birds that lay them. All the troubles in this respect arise from defective secretions, due principally to low vitality. It is in this direction then that we must look for the remedy. Faulty feeding may, in some cases, be responsible for such troubles, but when special feeding has to be resorted to in an attempt to improve the shell, or the egg generally, it can be taken that all is not well with the flock, and that better attention should be given to the breeding.

The same thing applies to the small eggs, which are becoming far too numerous. Bad breeding and early maturity are the fundamental causes. By early maturity is meant pullets laying too early, say, four and a half to five months old. This is a condition that can be the result of faulty breeding, feeding, or rearing. In other words, stunted growth from whatever cause may bring about these troubles. The farmer who attempts forced development by feeding will invariably find that he will produce early maturity in his pullets with all its train of evils. Given good stock, nothing of this is necessary. The downfall of all the older breeds of fowls that have come under my notice has commenced with the defects mentioned. This makes one anxious for the welfare of the three principal breeds—Leghorns, Orpingtons, and Langshans—upon which the poultry industry, with its thousands of farmers, depend.

Without doubt low-grade chickens are responsible for a large portion of this trouble. There is too much of a disposition to take the lines of least resistance by purchasing chickens instead of breeding and hatching them on the farm, and unless poultry-farmers can be brought to realise the importance of this matter there is disaster ahead of the industry. We are, in fact, following the lines of the bad example of a portion of another country which is not renowned for high productivity or quality of birds. The bald fact is that only by breeding from well-selected birds can the poultry-farmer hope to succeed, or the industry be maintained on a sound footing.

With a demand for a better egg for export, such as will be enforced under the Commonwealth regulations shortly to be issued, the rejections will be enormous unless poultry-farmers wake up to the facts stated, and let no one deceive himself—this is where the shoe will pinch in the not distant future.

Better eggs must therefore be the farmers' slogan, and there is only one way to secure better eggs—that is, breed good birds and rear them well.

It is now too late this season to mend up the breeding part of the contract, but it is not too early to attend to some of the other requirements of the future. The rearing part is in a large measure under one's own control, and should receive extra attention in order to obtain best results.

A Reminder on Culling.

A close watch should be kept on hens that go off laying towards the end of this month or the early part of next. If production is falling too low a weekly examination should be made to ascertain the condition of the hen. This is more than usually necessary in order that hens that have not finished laying be not marketed too soon. There is usually a lull in production about the time mentioned, at which many take alarm and imagine that the hens that are taking a short spell have finished their profitable laying period. This is not necessarily so, and most hens will commence laying again after a short rest. A good guide is afforded by the pelvic bones. If these are soft and pliable and moderately wide apart there is a chance that the hen will resume production after a short rest. On the other hand, if they are closed and becoming rigid it is fairly safe to dispose of the bird. This test should not be applied to pullets which have not commenced to lay.

A Fitzroy Seed Maize Contest.

In order to encourage those farmers who are growing Fitzroy maize, the Department has arranged to conduct a contest among producers of different strains. Seed will be sown on a selected area at Grafton Experiment Farm, and the Department's certificate awarded to the farmer whose sample gives the highest yield.

Farmers who have devoted attention to seed selection and who, therefore, have good strains of the variety named, are invited to forward 5 lb. of seed to the Manager, Government Experiment Farm, Grafton. It will be necessary to limit the number of competitors to about twenty-five, and the Department also reserves the right of refusing any entry not sufficiently pure or true to type, so that the purity of seed at the Farm will not be endangered. Somewhat similar tests have been conducted in the past on the North Coast, and have proved of considerable value in improving the yielding qualities of maize, and have also been of benefit to farmers by reason of the demand which has been created for seed.

Inquiries should be addressed to the Farm Manager, or to the Under Secretary, Department of Agriculture, Sydney.

Orchard Notes.

OCTOBER.

W. J. ALLEN and H. BROADFOOT.

Codling Moth.

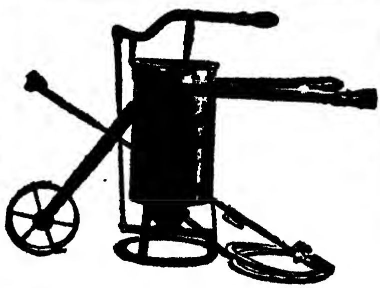
In the earlier districts the first spraying for this pest should have been completed, but in later districts it will be necessary to make the first application during the current month. The codling moth is a pest which exacts heavy toll from the apple and pear crop unless adequate and timely measures to keep it in check are taken, and it is only by concerted action by all growers that satisfactory results can be achieved. In last month's *Gazette* stress was laid upon the great necessity of minimising the number of carry-over grubs from which the new season's infestation must take place. Growers who carefully examined cases and bandages, made a thorough search in the packing shed, destroying any sheltering grubs before they emerged, will greatly reduce the infestation. If not already attended to, no time should be lost in the completion of this work.

The use of bandages is strongly recommended, because on leaving the fruit the grubs seek a sheltered harbour in which to pass on to the next stage of their development. Bandages placed upon the tree offer such a harbour in which sheltering grubs are easily located and killed.

The most important operation for the month will be spraying. The first, or calyx, spray is absolutely essential. This is borne out by the fact that since spraying was practised very few apples and pears are found in which the grub has entered the fruit through the calyx end. This applies to all varieties of apples and pears growing in early and late districts. Some growers claim that upon some varieties grown in certain localities, the grubs do not start to operate until some time after the calyx has closed, and it would—they say—be advantageous to defer the first spray until just before the first eggs are hatching.

This is a great mistake. If spraying is done before the calyx is closed the poison is forced into the calyx or cup, and when the sepals close the poison is locked in there, and the grub finds poison in its track when it attempts to enter by way of the calyx before or after the sepals close. The grubs prefer to effect an entrance upon a rough spot on the apple or pear. This is borne out by the fact that after a hailstorm has roughened the surface of the fruit the grub usually chooses one of the hail marked places to enter, and when two apples are in contact the point of contact is a favourite spot for entrance by the grub.

The first lead arsenate spray should be applied when the petals are falling, and before the calyces of the earliest blooms are closed. Not only do we strongly recommend this calyx spray, but in certain varieties in some seasons it is advisable to give a double calyx spray, as very often there



is a very wide gap between the first and the last blooms. When this is the case the trees should be sprayed just before the calyces of the earlier blossoms close, and again in a few days before the calyces of the late blossoms close. A good power pump, with long distance nozzles, subsequent to speedy completion of the preparatory work, mixing, filling, and carting, will greatly facilitate the work. The first spray is essential, and growers would be well advised to see that the work is thoroughly performed. Only a short time remains in which to apply the first spray effectively, and growers should pay every attention to the work and should work as expeditiously as possible.

It is very noticeable that growers who are getting good control sometimes think they can save money by cutting out some of the work in connection with the fight against this pest. It may be remissness in examination of bandages and cases, or in destruction of some of the infected fruit. But it is a "penny wise, pound foolish" policy. It is easier to keep a place clean than to clean up a dirty one.

It may also be pointed out that in many districts trees have been planted so close to fences, ditches, and drains that when the tree has grown great difficulty is experienced in spraying them, and when they are sprayed the work cannot be done effectively. It is impossible also to cultivate the land effectively in such places. This means that in seasons when there is a luxuriant growth, infested fruit which falls from the tree may escape observation. The grubs leave such fruit and pass on unchecked to the next stage of their development.

Black Spot.

This fungus, if prevalent, greatly reduces the crop, and in many districts materially reduces the quality of pomaceous fruits. It should be borne in mind that the fungus is pre-eminently preventable.

Never wait until the disease has made its appearance. The spraying should be anticipatory. The sprays that are widely and efficaciously used for control of black spot are Bordeaux mixture and lime-sulphur. When Bordeaux mixture is used after the early spur-burst stage, there is always a danger of russetting the fruit and the russetting is always more pronounced in a wet season. Bordeaux mixture used at the pinking stage, as well as later applications, will often cause more or less russetting, but the period during which the fruit is most susceptible is at the calyx stage and for some time following.

Apple Leaf Jassid.

A strict watch should be kept for the appearance of the apple leaf jassid. This pest does a considerable amount of damage to the foliage by sucking the sap and causing the leaves to shrivel, and in many cases it discolours the fruit by exudations and excrement. Good clean cultivation is necessary in fighting the pest, and applications of a nicotine wash will be found effective, especially in the larval stages of the development of the insect referred to.

Aphis.

A watch should be kept on peach, nectarine, and cherry trees for aphis, and when observed the trees should receive an application of tobacco wash or nicotine extract. When applying the spray, a good force is necessary to break up the clusters of aphis. Do not apply this spray in the form of a mist, but as a wash.

Disbudding.

Stocks which have been grafted or cut back to buds which were put in during the previous summer should be examined periodically to see that growths from the stock do not rob the shoots from the bud or graft. Where the stocks are old trees that have been worked to a new variety, it is advisable not to rub out all the shoots from the stock, but to leave some of the weaker ones, merely pinching them back, so that they may afford some shade until the head of the tree is sufficiently formed. Where any scions of grafted trees have failed, ample shoots from that part of the stock should be left to be budded later on.

Surface Drains.

Growers should see that the necessary drains are made to carry off storm water. Much damage is done by storm water washing soil from higher to lower levels and growers are put to much expense in replacing it, but a little care on the part of the grower in providing adequate drainage will save a good deal of time and expense.

Cultivation.

Many growers will look back upon last season with some feelings of regret, as carelessness and neglect were displayed in respect to cultural work. Last season was distinguished by lack of rain, and some growers failed to conserve available moisture by the maintenance of a sufficiently broken surface, and by failure to check weed growth, which of course reduced by transpiration the moisture available to the tree. The result was a large percentage of undersized fruit, and as a natural consequence reduced monetary returns. It cannot be too often emphasised that good cultural work is necessary in all seasons, but especially so in seasons when rainfall is below the average.

Any young citrus or deciduous trees should receive special attention in the way of cultivation. Use the hoe frequently and keep the ground well worked round the trees. Young trees should be kept growing, as the sooner a good tree is developed the sooner will the grower reap a return. Many young trees suffer considerably from lack of moisture on account of careless cultivation.

Marketing.

The Valencia late oranges will be forwarded in large consignments this month, and growers would be well advised to pay every attention to proper marketing. The fruit should be carefully handled and well graded for size and quality.

VOL. XXXVII. PART 11. NOVEMBER 1, 1926

Agricultural Gazette of New South Wales.

Producers and Consumers' Conference.

THE BATHURST ROUND-TABLE.

I am going away back to Sydney immensely gratified with the results. The Conference has succeeded quite beyond expectations. We have accomplished many things, but the greatest is that those who formerly imagined that they were opposed to one another have been able to discuss their problems together for several days without a semblance of disagreement or disorder. It has been a magnificent success, and I feel the deepest gratitude to the delegates for the manner in which they have approached the problems before them.—The Hon. P. F. Loughin, M.L.A.

The producers have welcomed the opportunity of meeting the consumers and of acquainting them with the difficulties attending production, and we congratulate the Minister on the success of the gathering. The spirit in which the delegates have met together has been wonderful.—H. J. Bate, M.L.A.

The delegates have had unrivalled opportunity for exchanging their points of view, and nothing but good can come of it.—Professor Mills, Sydney University.

The results may not be immediate, but they must eventually be of the greatest good.—R. B. Suttor, representing the Graziers' Association.

I have attended many conferences, but this is the greatest ever held in New South Wales. Many delegates were very frightened at the presence of delegates from the Trades Hall, but the Conference has eradicated feelings of opposition that formerly existed between producers and consumers, and we on the consumers' side have appreciated being here.—J. S. Garden, representing the Trades and Labour Council.

With such expressions as the above, the Producers and Consumers' Conference was brought to a close at Bathurst on Saturday, 25th September. These and other remarks of a similar kind may be accepted as conveying the general sense of gratification felt by the delegates, and the value they attached to the week's deliberations. The event, unique in itself, was regarded by all as a marked success, and those particularly involved were unanimously and avowedly pleased with the results attained.

The Conference began on Tuesday, 21st September, lasted over four days, was marked by excellent goodwill and unanimity throughout, and issued in a series of recommendations which should prove of practical help in the solution of many of the problems approached. That interests always regarded as mutually opposed to one another should have met in such a spirit, and have preserved that spirit throughout most critical analyses of the many problems involved, cannot but be beneficial, apart from the direct accomplishments recorded.

In anticipation of the requirements of the delegates in approaching the various problems, a compilation of statistical and other material had been made by officers of the Department of Lands under the Minister's direction, and the immense mass of detail which had been tabulated, and effectively

illustrated by diagrams and graphs, led to the expression of the hope that this service to the community would be continued. From the booklet in which this invaluable material was presented has been taken the comprehensive graph on page 794.

The Opening Sessions.

Delegates foregathered from all parts of the State, representing every primary industry of any importance—from the vast interests of the graziers to the more intensive but increasingly significant pursuits of poultry-keepers, apiarists, and tobacco-growers, while the city consumer was present in the persons of delegates from the Friendly Societies, Consumers' Co-operative organisations, Housewives' Association, Workers' Educational Association, Trades and Labour Council, various unaffiliated unions, and other non-producers—as the term is commonly understood. In order that the more specialised scientific, practical, and economic knowledge necessary to the work of the various sections might be available, the attendance had also been secured of officers from the research and field branches of the Department of Agriculture. It had also been arranged that representatives of the City Council, Department of Public Health, British Medical Association, Water Conservation and Irrigation Commission, Railway Department, Weights and Measures Department, Government Savings Bank, Meat Industry Board, and Professor Mills, of the University, should be present to assist any committee whenever desired.

Thus a gathering of well over 200 delegates and others qualified in many ways to tackle weighty problems confronted the Hon. P. F. Loughlin, Minister for Lands, the President and Convener of the Conference, at the opening session in the Church Memorial Hall.

In welcoming the delegates, Mr. Loughlin remarked that in convening such a conference the Government had broken new ground, and by way of allaying the suspicions of some he assured them that "we have not the slightest idea—to use a colloquialism—of putting one over you. I know you wanted that assurance, and I am giving it to you early." He had done his best in the last six months to collect data that would be useful to the purposes of the Conference, but beyond assisting in that way he had no end to serve, and he offered the delegates a clean slate upon which they could write whatever they chose. He would not pledge the Government to accept all their recommendations, it might even be that the Government would not be able to accept any of them—but it was manifest that the decisions of such a gathering would be of very great importance.

Certain formalities (including a civic greeting) occupied the rest of this opening morning, and when delegates assembled at 2 o'clock they did so with a serious air. It had been anticipated by the promoters that a general discussion at this stage would do much to clearing a track for the rest of the week, and the programme had set aside the afternoon for that purpose.

The President began by outlining more fully the problems that confronted the delegates. The gap between what the producer received for his product and what the consumer paid for it was altogether too wide, he

said. In the case of milk, for instance, the farmer, with all the risk he ran, the labour involved, and the outlay required, only got one-third of what the consumer paid, and the children in the cities were unable to get in sufficient quantities the milk that medical authorities agreed was essential to proper health and development. The distributor was essential to the community—he was doing for the people what they could not do for themselves—but the present system was unsound, archaic, and cost too much. Potatoes, tomatoes, and other necessaries also illustrated the "spread" between producer and consumer. The fact was, distributing methods were lagging behind production methods, for while research was attacking the problems of production, the problems of distribution had so far received only a limited attention.

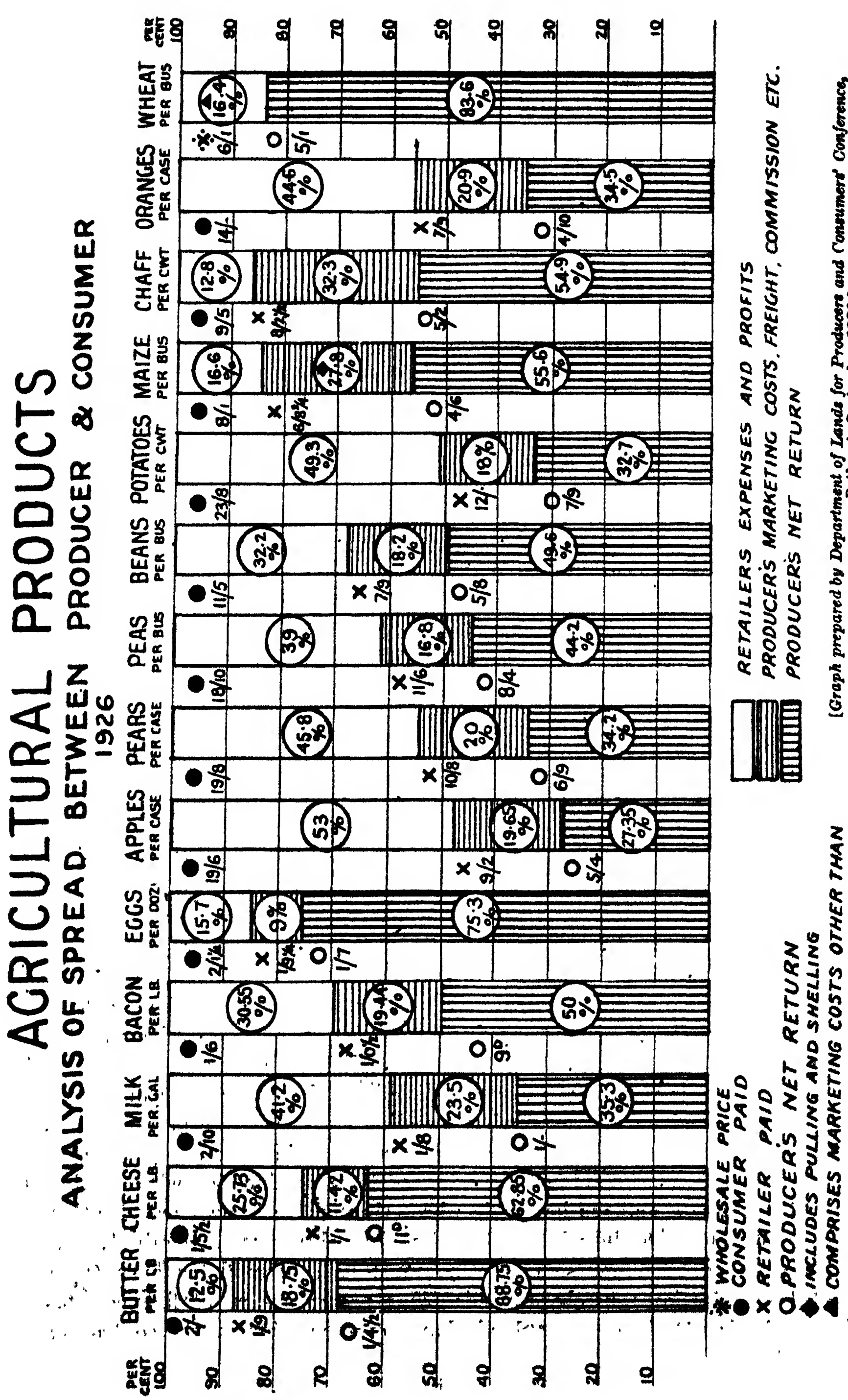
Collective effort would result in better distribution, the development of the local market (the best and most profitable outlet), and the elimination of interstate competition, and would assist in the matter of finance.

The rest of that afternoon afforded a valuable opportunity for interests often regarded as opposed to one another to express their points of view and their objectives, and to learn that after all they had more in common than they had perhaps previously realised. Those delegates from the farms and orchards who spoke indicated the earnest desire of producers to assist in the solution of the problem of the "spread" between producer and consumer, while delegates from the Trades and Labour Council and from specific unions assured the workers in the country that it had long been the desire of the workers in the cities to meet the workers in the country in conference. All fully agreed with the principle of the worker in the country receiving the cost of production. Bogies, said Mr. J. Garden, had too long kept the producer and consumer apart.

Motions and amendments figured prominently during the remainder of this session, but gradually they were found to come short of the requirements of the hour, and when at 5 o'clock the President skilfully "wiped the slate," it was felt the afternoon had well served its purpose.

The Hon. W. F. Dunn Overseas.

On the morning of the second day of the Conference, the Hon. W. F. Dunn, Minister for Agriculture, addressed the delegates on the problems of the distribution of primary produce, outlining in an instructive way the impression he had formed of marketing conditions in England and elsewhere during his recent tour abroad. Mr. Dunn began by reaffirming that he was not an advocate of compulsory pooling, but a position had now been reached when wheat-growers in particular must decide whether they would return to pre-war methods of disposing of their produce, or whether they would co-operate and market their wheat through their own organisation. To ensure success in the latter direction four things were required:—(1) The movement to organise marketing must be a compulsory one; (2) a sound organisation must be created; (3) a proper system of finance must be provided; (4) the growers should have representation on the controlling authority.


AGRICULTURAL PRODUCTS
ANALYSIS OF SPREAD BETWEEN PRODUCER & CONSUMER
1926
BUTTER PER LB
CHEESE PER LB.
MILK PER GAL
BACON PER LB.
EGGS PER DOZ.
APPLES PER CASE
PEARS PER CASE
PEAS PER BUS
BEANS PER BUS
POTATOES PER CWT
MAIZE PER BUS
CHAFF PER CWT
ORANGES PER CASE
WHEAT PER BUS
PER CENT
RETAILERS EXPENSES AND PROFITS
PRODUCER'S MARKETING COSTS, FREIGHT, COMMISSION ETC.
PRODUCER'S NET RETURN
WHOLESALE PRICE
CONSUMER PAID
RETAILER PAID
PRODUCER'S NET RETURN
INCLUDES PULLING AND SHELLING
COMPRISES MARKETING COSTS OTHER THAN HARVESTING AND BAGGING
[Graph prepared by Department of Lands for Producers and Consumers' Conference, Bathurst, September, 1926.]

Prices during recent times had been very satisfactory, but growers must not expect this state of affairs to continue. They must take the necessary steps to protect their own interests and to control the disposal of their produce. The following figures showed that the recovery of Russia, as one single factor, made organisation necessary:—

Up to 1914, Russia's average wheat export was	179,000,000 bushels.		
In 1917 ,, actual ,,	8,000,030 ,,		
In 1925 ,, ,, ,,	50,000,000 ,,		

The increasing use of tractors in Russia had also its significance:—

In 1921 there were	500	tractors in use in Russia.
,, 1923 ,,	1,200	,, ,,
,, 1925 ,,	10,090	,, ,,
,, 1926 ,,	29 000	,, ,,

Organised marketing meant that farmers could secure full return for their labours, feed the market without flooding it, and secure considerable savings in freight and insurance as a result of collective bargaining. To-day, every trade and business was highly organised, and the farmer was faced with many business groups operating under "honourable understandings," with secondary industries protected by tariffs and with all other workers well organised. The farmer alone was still following the path of the individual, and consequently was not protected against market fluctuations. "He is entitled to a fair return on his outlay for labour and working costs, he is entitled to a reasonable standard of living, but if he desires to secure this he must organise in such a way that he will, through his own organisation, control his own business in the future."

The outstanding feature of the last few years seemed to Mr. Dunn to be the failure of attempts to establish an effective voluntary pool. The organisation created by the Voluntary Wheat Pool Committee, Ltd., in its first year, handled 68 per cent. of the crop, but last season only about 3 per cent. was pooled with the organisation then operating.

The Voluntary Wheat Pool Committee published full and complete accounts, and their management did not appear to have been adversely criticised at any time, yet the quantity pooled each season dwindled until the directors themselves announced that unless the pool received sufficient support to make it effective it must be discontinued. To-day, any effort to place wheat marketing on a more satisfactory basis from the growers' point of view was doomed to failure unless the support of all growers could be secured.

Experienced farmers in all districts condemned existing methods, and organisations representing among others, a great body of wheat growers, had indicated that they had realised the need for organised marketing. It was recognised that this would be more effective if it embraced the whole of the wheat-growers of Australia as against those of any one State. However, this did not appear possible in the near future, but in the meantime an organisation should be perfected.

The first essential in any project of this kind was finance. In the past it had been necessary for the promoters of any pooling scheme of importance to seek financial assistance from some Government, or at least to secure the backing of the Government in their negotiations with the banks. To what extent the Government was entitled to use the credit of the State to assist a particular industry or section of the community, was perhaps debatable; but it was generally recognised that the State's credit could not be so used unless the Government was assured that the management of the undertaking would be on sound lines. "The Government is anxious to assist wheat-growers in the disposal of their product to the best advantage, but the Government represents the community as a whole, and while it would favourably regard a definite request for the establishment of a compulsory marketing organisation, it could only give effect to any such proposal if provision is made to safeguard, should the necessity arise, the interests of all concerned."

Mr. Dunn then proceeded to give some account of the enquiries he had made into the marketing of Australian produce while he was on tour abroad. He touched many subjects and indicated the peculiar requirements of the market in regard to a number of lines of produce. It had to be recognised in approaching the problem that it was very hard to effect any change in marketing conditions in England and Europe. A good deal might be done with sufficient backing and organisation, with continuity of supply and uniformity of product, but it was impossible to force Australian ideas on overseas consumers. We must meet them with conformity to their ideas as buyers.

A good deal of overlapping occurred both here and in England, notably in regard to inspections. It was not uncommon to find six or seven people inspecting a consignment—an enormously wasteful system. It should be possible to meet all requirements with one inspection, and he suggested the licensing of all exporters, throwing upon them full responsibility as to their exportations, and reserving the right to cancel their licenses and estreat their bonds if they failed to comply with their obligations.

Regarding Imperial preference, he found a very friendly feeling toward the Dominions in Great Britain, but to expect any preference for their produce on the ground of national feeling was to lean upon a very weak reed. It might be a small factor, turning the scale if other things were equal, but it was the goods and their presentation that would make sales. "We have got to fight for our markets, and we have got to meet competition, and we need not rely on any adventitious aids of that kind." At the same time there was a keen desire to trade in Australian products, which already were receiving attention.

Regarding New South Wales wheat, he formed an impression that it was not quite as good as it once was, and not quite so good as that from other States. It was certainly not so clean as the wheat of other States, and it would be a good thing if the wheat of this State were improved in that

respect. He found the English grain buyers did not care for the idea of being compelled to accept a Government certificate as final. It was true they had accepted that system in the case of Canada, but that was in exceptional circumstances, and they had made it clear to himself and to Mr. Valder that they would not again agree to it. They would be glad to handle Australian bulk wheat in grades, but they would only buy on sample, and would reserve the right to arbitration. In his own judgment three grades would be sufficient, samples of each of which would have to be lodged with representative institutions in England.

The condition in which Australian meat was marketed was unsatisfactory, but he was greatly impressed with the highly organised methods of our competitors, and the excellent quality of their products. The Argentina meat was of notably high quality, and the stalls on which it was sold at Smithfield could easily be picked out by the appearance of the meat. The Prime Canterbury mutton and lamb from New Zealand also met the requirements of the English housewife, and the exporters everywhere advertised their product with confidence. Personally he was satisfied that Australia must have some authority that would handle its export meat and see that it reached the market in proper order. There was no doubt that the opportunities at present offered by the market were not being availed of, whereas small countries like Iceland and Czecho-Slovakia had in recent years begun to put small quantities of meat on the market, and were increasing them steadily. The improvements that seemed to him essential in connection with the meat export trade were: Improvement in quality, grading, and dressing; continuity of supply; production of an early maturing beef, evenly fattened, to compete with Argentina; reduction in ocean freights to enable competition with Argentina; greater care in slaughtering and dressing, and in loading and unloading of carcases at every stage; decentralisation of shipments; control of shipments to market requirements; elimination of unnecessary intermediaries; scientific investigation of methods of refrigeration; control of cold storage in Great Britain; and establishment of growers' organisations with representation in the United Kingdom.

The first essential to greater success in the export meat trade was an improvement in the quality of the produce and an improvement in the livestock themselves—in other words, better breeding methods must be regarded as primary. We wanted better conditions for the carriage of stud stock. With the objective of the free carriage of live stock he saw the shipping companies, and others, and finally an arrangement was made that the shipping companies would be prepared to carry stud stock free of freight, provided the Imperial, Federal, and State Governments would defray inland rail freights and other charges, together with certain other incidental expenses, so that the producer (if a *bona fide* breeder and not a dealer) should receive the stock at the price ex stud farm in the United Kingdom. He hoped that proposal would be agreed to by the other parties affected.

Regarding the distribution of Australian canned fruit in England, he found that the quality of the fruit was satisfactory, but the methods of packing were crude and slipshod. The contents required to be more even and the containers improved in appearance. He had investigated various methods of marketing, including (1) direct sales to consumers, (2) direct sales to retail shops through Government-owned or controlled organisation, (3) direct sales to retail shops through existing wholesale merchants, (4) sales to multiple stores, and (5) sales through brokers. The difficulties and advantages in each direction he had carefully explored, and though he had left Australia with a prejudice against the broker, he found that system so deeply entrenched in Great Britain that he now believed it had to be accepted, and he had been forced to conclude that marketing through the brokers was probably most satisfactory, especially as all other channels were reached in that way. The broker could only be eliminated by an extensive organisation on co-operative lines, and in the meantime the Australian producer could not attain that.

Other export lines, such as eggs, spring chickens, honey, prunes, canned meats, etc., had received attention from him, and useful information had been collected for the benefit of each class of producer. The possibilities of development of Continental markets had also been explored. In all directions the necessity for collective action had impressed him, and he had returned confident that producers had much to hope from a systematic co-ordination of effort in regard to export marketing, and with the conviction that the home market was the most secure and profitable.

Getting to Work.

From this valuable survey of export conditions the Conference turned to the appointment of the committees which were to confer as to each separate industry and interest. The scheme adopted was to appoint a committee representing each principal primary industry or group of industries, and committees of consumers who would meet and confer with them. Special committees regarding transport, finance, etc., were also set up to confer with each of the above committees as required, while it was the function of a co-ordinating committee to ensure that any conflicting recommendations should be reconsidered by the various committees and brought into conformity with one another. Above all, the coping-stone of the whole edifice, was the Executive Committee, to which all reports were finally addressed and considered before being placed before Conference.

In addition to the Executive Committee (of which Mr. A. A. Watson was Chairman) and the Co-ordinating Committee (with Mr. J. J. Sheils as Chairman), there were four special committees—(1) Transport (Mr. C. J. Goode, Goods Superintendent of Railways, Chairman), (2) Marketing Facilities (Alderman F. Green, Sydney City Council, Chairman), (3) Finance (Mr. A. W. Turner, Secretary to Government Savings Bank, Chairman), (4) Weights and Measures (Mr. J. L. McAlister, Superintendent of Weights and Measures, Chairman).

The producers' thirteen committees were: (1) Citrus Fruits (Mr. J. Heane, Chairman), (2) Deciduous Fruits (Mr. H. S. Wark, Chairman), (3) Vine Fruits (Mr. A. H. Wilkinson, Chairman), (4) Dried and Canned Fruits (Mr. G. J. Evatt, Chairman), (5) Vegetables (Mr. J. H. Gilbert, Chairman), (6) Wheat (Hon. A. K. Trethowan, Chairman), (7) Maize (Mr. J. D'Arcy, Chairman), (8) Potatoes (Mr. J. S. Whean, Chairman), (9) Butter, Cheese, Bacon (Mr. G. W. Gordon, Chairman), (10) Fresh Milk (Mr. E. L. R. Keech, Chairman), (11) Poultry and Eggs (Mr. J. Hadlington, Chairman), (12) Sheep, Cattle and Wool (Mr. R. S. Suttor, Chairman), (13) Miscellaneous Products—lucerne, millet, tobacco, honey and beeswax—(Mr. R. Richardson, Chairman).

The consumers' committees numbered four, as follows: (1) Fruit, Potatoes and other Vegetables (Mr. S. H. Dickson, Chairman), (2) Dairy Products—fresh milk, butter, bacon, cheese—(Mr. D. Stewart, Chairman), (3) Meat, Poultry, Eggs and Fish (Mr. H. Sheddin, Chairman), (4) Wheat, Flour and Bread (Mr. A. E. Bosley, Chairman).

The setting up of these committees had been completed by midday on the second day, and they promptly set to work. Wednesday afternoon, Thursday and Friday were devoted to their deliberations. A great deal of valuable contact was obtained between the committees representing various industries and interests, and many delegates found themselves involved in complex problems. Long sessions were spent in the effort to reach decisions that would be of permanent value, and in many instances the conclusions are likely to prove most important. The recommendations of the different committees in the total would run into many pages of the *Agricultural Gazette*, and it has been found impossible at this stage to give even a summary that would be satisfactory in the circumstances. It is the intention of the promoters of the Conference to compile and publish an official report, embodying all the recommendations, and to that document readers must be referred.

The Closing Session.

On the Saturday morning, 25th September, delegates assembled in open Conference for the purpose of hearing the report of the Executive Committee. It was obviously impracticable for the Conference as a whole to traverse the recommendations of the sectional committees, and the report, which had been adopted unanimously by the Executive Committee, was therefore a very brief document. Its terms were as follows:—

1. The various Committees indicate generally, by their reports, that they favour the principle of collective marketing and distribution.
2. That in order to make this principle effective it is recognised that producers must have the opportunity of indicating by a ballot that the handling of their particular product should be controlled by a Board on which producers should have direct majority representation, with reasonable representation to consumers.

3. A general desire has also been expressed for closer co-operation between producers and consumers' organisations for the purpose of improving marketing facilities, and the exploiting of markets abroad.
4. Reports of the various Committees are attached and form portion of this report.
5. The Executive recommends that every member of Conference be supplied with a copy of the report.

(Signed) Geo. H. Buckland, Walter A. Coulson, H. E. Elliott, Geo. F. Oram, A. A. Watson (Chairman).

Following the adoption of this report, on the motion of Mr. A. A. Watson and Mr. J. Brann (Albury), the following motion was submitted by Mr. H. J. Bate, M.L.A., and seconded by Professor Mills:—

"The Conference desires to offer to the Minister, Mr Loughlin, its heartiest congratulations on the success of his efforts in bringing together in Conference representatives of producers and consumers.

"Such a gathering has offered a unique opportunity for the full exchange of points of view which will be of lasting benefit to every interest represented.

"There can be no doubt, too, of the statistical value of the booklet issued to Conference, which has formed the basis of valuable discussions in the various Committees and might well be continued by the Department.

"The Conference also wishes to place on record its appreciation of the valuable services of Mr. Watson, Mr. Sheils, and their assistants."

The motion was supported by Messrs. R. B. Suttor, Graziers' Association, and J. S. Garden, Trades and Labour Council, Mrs. Perry, Housewives' Association, and Mr. G. F. Oram, Mudgee, and formalities brought the proceedings to a close.

Definition of Various Fallows.

At the recent conference of Agricultural Instructors of the Department it was recommended that fallows of different periods should be defined as follows:—

Long Summer Fallow.—Land fallowed for at least twelve months, the initial ploughing or cultivation to be not later than May in the year previous to sowing.

Winter or Ordinary Fallow.—Land fallowed for at least six months, the initial ploughing or cultivation to be not later than October in the year previous to sowing.

Short Summer Fallow.—Land fallowed for at least two months, the initial ploughing or cultivation to be not later than February in the year of sowing.

Wheat-growing in the South-west and Riverina.

[Continued from page 724.]

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

SPECIAL METHODS OF CULTIVATION FOR DIFFERENT SOILS.

The cultivation methods outlined in last month's article may be considered specially suited to the medium red loams of the Riverina, and can be adopted (with any slight modification indicated by the weather conditions obtaining at the time) on the bulk of the wheat soils of granitic origin found in the south. Although the principles of fallowing remain constant, practical experience has evolved different cultivation systems for special types of soil which bring about the desired final condition in a more effective manner.

Light Sandy Mallee Soils.

The medium to strong mallee soils will not be discussed separately, as they can be worked (according to their nature) in the manner recommended for medium to heavy loams. It is necessary, however, to discuss the light sandy mallee soils in detail, as it is only during very recent years that any attempt has been made in New South Wales to grow wheat on these soils. Similar soils have been farmed in Victoria with success, but there are many experienced men in New South Wales who consider these light sandy mallee soils almost useless for wheat growing. This is not the case, however. As there is a considerable area of this class of country within the wheat belt in New South Wales, and as it is now being readily taken up by intending wheat farmers, the recommendations for this class of country, based as they are on experiences and observation as well as field experiments, should be a useful guide to mallee farmers.

The typical light sandy mallee soil is so light that it is extremely difficult to obtain a compacted sub-surface; the surface also is readily blown away—in fact, in dry windy weather so much is blown away that one farmer had eleven sheep smothered in a corner of his fallow during a dust storm. To assist in obtaining a consolidated sub-surface the land should only be ploughed 3 to 3½ inches deep. The mouldboard plough should be used, never the disc, and the land should not be ploughed dry. Plough, if possible, immediately after rain while the soil is still moist, in an endeavour to get the soil to break up with a cloddy surface. This country always breaks up too fine, and it is extremely difficult to get any clods at all. There is no danger of getting buried clods in the fallow, consequently there is no need to use the springtooth cultivator on the fallow. Harrows are the best implement for conserving moisture. When it is necessary to destroy weed growth, a stump-jump scarifier or skim plough should be used, the implement being set to go as shallow as possible.

If these soils are harrowed immediately after rain the surface breaks down too fine, but if the fallow is allowed to remain after heavy rain for a few days until the surface has dried, a surface crust about a half to three-quarters of an inch in thickness will be formed. This crust is not hard and solid as in heavier soils, and if the harrows are then used it will be broken up into small flat clods about 2 to 3 inches by 3 to 4 inches, and about a half to three-quarters of an inch thick. This forms a good surface mulch for this class of soil, preventing evaporation, and also preventing the surface soil from being blown away. The aim should be to obtain a mulch of these small flat soft clods on the surface, and below that 1½ inches of loose dry soil, and below that again a firm compacted moist seed-bed.

By shallow ploughing, with the special use as advised above of the harrows after the surface crust has actually set, and the shallow use of the skim plough or scarifier when necessary to destroy weeds, together with the heavy grazing of sheep, it is possible to obtain a very satisfactory fallow. The rainfall, weight of sheep, horses, implements, &c., passing over the fallow all assist in the compacting of the sub-surface. However, these soils are so light and the rainfall usually so scanty that insufficient compaction is generally found. This lack of consolidation can be best overcome by the use of a heavy spiked roller while the soil is still moist underneath during the months of March or April. Always follow the roller with the harrows, or if necessary with the scarifier (set shallow), and never roll earlier in the season than March, or the clods will be destroyed too early in the season. Of course, the roller cannot be used effectively on very new mallee soils, on account of the prevalence of stumps. It is quite surprising to see the marked improvement brought about in the subsequent crop by rolling. Some success has been obtained by rolling immediately after sowing the crop, but it is preferable to roll immediately before sowing rather than after. If desired, the crop could be again rolled about the end of July or early August.

After these light soils have been cropped for a few years they improve in physical condition. It is much harder to obtain clods in new mallee soils than on older lands. The consolidation also is much harder to obtain on the new soils. They also improve wonderfully from a grazing point of view after a few years of cropping. They are quite useless for grazing for the first few years, but the cultivation and the liberal use of superphosphate, to which these soils readily respond, considerably improve the carrying capacity. No wheat soils in New South Wales respond so well to heavy dressings of superphosphate as these light mallee lands. For the first few years very little stubble is produced by the crops, consequently it is very difficult to obtain a good stubble burn. Flag smut is, therefore, often very prevalent.

Being of a sandy nature, these soils heat up very quickly in the early summer, and great judgment must be exercised, not only in the careful fallowing of the land, but also in the choice of variety and date of sowing.

Thick short crops should be aimed at to shade the ground, as where the crops are thin the soil gets heated to such an extent that the crop is often ripened prematurely.

Heavy Red and Brown Loams (including Plain Country).

On those heavy Riverina soils which run together so easily after rain and set very hard, many farmers have found it advantageous to use wide tines

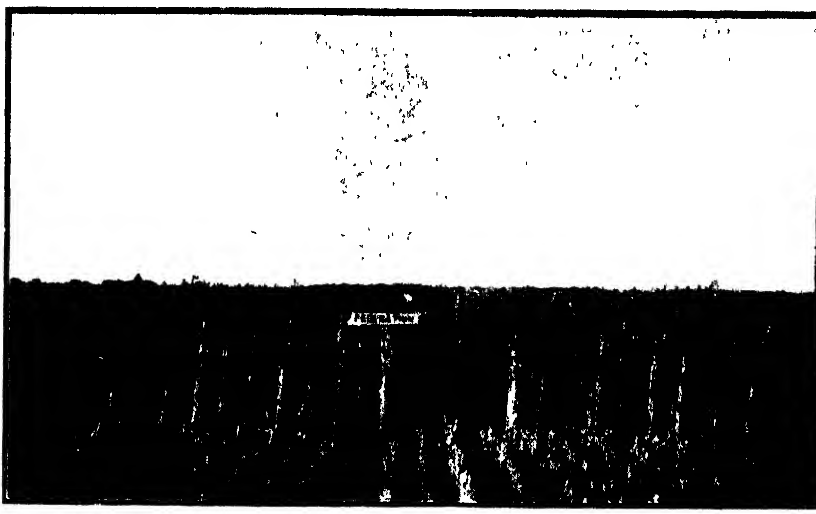
A Five-furrow Stump-jump Mouldboard Plough.
A popular type for the Mallee country.

A Skim Plough.

on the scarifier. These tines are rather effective in destroying weeds, but their special virtue in this particular case is the fact that they leave comparatively deep furrows and high ridges. Although it may be thought that this tends to increase surface evaporation, it is, as far as we know at

present, not objectionable, as it gives the most effective mulch possible on these soils. This system is therefore desirable on these heavy soils. A level surface mulch, although effective when first obtained, is quite useless after heavy rains, and extreme difficulty will be experienced in working up such a fallow after it has set hard with rain. The ridged fallow, on the other hand, after heavy rain has fallen only sets hard at the bottom of each ridge, the ridges themselves being quite friable, and a cross cultivation with the same wide points on the scarifier or springtooth cultivator will bring the fallow back into good condition, and leave a loose surface mulch with the ridges running in the opposite direction.

On the lighter and more friable soils, where the knife bar on the scarifier is used for weed destruction, a fairly level surface is the result, even when wide points are used. This, of course, is the better condition where the



Experiment Plots on Light Mallee Soil at Moombooldool.

soil will permit of this treatment, as less evaporation takes place from such a surface. However, on the very heavy loams and the heavy clay soils of the Riverina and South-western Slopes, the best method to adopt is to leave the surface fairly deeply ridged by wide points on the cultivator.

It is difficult to maintain a cloddy surface on these heavy soils, and it is this fact that renders them difficult to work. Many maintain that they are easily overworked, and to some extent this is the case. It is necessary, however, that they be worked a sufficient number of times, otherwise they do not produce anything like the yields they are capable of. On soils that actually are easily overworked, a good plan is to give one deep cultivation with a springtooth cultivator at the end of August or early September, then stock the fallow very heavily with sheep to keep down weed growth. If it is thought advisable, this fallow may be then left until after harvest before it is again cultivated.

From January until sowing time the fallow should be frequently cultivated as required, in an endeavour to compensate for the lack of cultivation in the earlier stages. Should the fallow be then worked down rather fine, it is no great disadvantage so late in the season. This system, together with the use of the wide cultivator points, which leave the soil ridged, makes it possible to thoroughly cultivate fallows, even on heavy soils that are otherwise easily overworked, and if they are adopted there is no need to skimp the number of cultivations given, even to these heavy soils that are otherwise easily thrown out of condition.

Semi-alluvial Soils.

All friable loams of a semi-alluvial nature may be included under this heading. These soils are usually very easily worked, and do not readily form

A Class of Surface Favoured on certain Heavy Loams in the Riverina.
The deep furrows and high ridges are left by wide cultivator points.

a surface crust, even when worked down to a very fine tilth. Such soils respond wonderfully to good cultivation, and will withstand frequent workings. They should be worked much in the manner described for medium loams, except that they can stand more working without being thrown out of condition. If they are worked down fairly fine in the spring, an early germination and growth of weeds and rubbish will result. This is very desirable, as they can then be destroyed by cultivation in the comparatively slack period before harvesting operations commence. The fallow will then be clean during the busy harvesting period, and will not require to be cultivated for weeds until after harvest. If this system is not adopted troublesome weeds, such as paddymelons, germinate later and make very vigorous growth in midsummer, harvesting operations prevent cultivation, and the weeds frequently get quite out of hand in spite of the grazing of sheep. These weeds are the means of losing a lot of moisture from the soil, and, in addition, the condition of the fallow is frequently injured by a deep cultivation with a disc in late summer in an endeavour to destroy the

paddymelons. The system recommended is also very effective when cape weed is troublesome.

These soils are very suitable for summer fallowing. If this cannot be practised, early winter ploughing is advised. Use a mouldboard plough and go to a depth of 4 to 4½ inches. The land can then either be left untouched for six or seven weeks, or may be harrowed immediately after ploughing. It should then be springtoothed 4 inches deep in late August or early September, and, with the idea of deliberately making the surface fine quite early in the year, it may be immediately harrowed. From that time on the harrows or rigid tine scarifier, as necessary, may be used to work the fallow.

Many weed seeds are locked up in clods, and so cannot be destroyed during the fallowing period. When, however, these clods are broken up and the surface is worked to a fine tilth, an excellent germination of weeds results, and they can then be destroyed. This system of fine working is only possible on friable soils which do not set hard after rain, and could not be adopted on heavier country, nor could it be followed on the very light lands, as the surface would certainly be too much inclined to blow or wash away. The cost of production must also be kept in mind, and no unnecessary cultivations should be given. The optimum number of cultivations depends on the locality, and varies from season to season with the rainfall. Usually in a very showery season a greater number of cultivations is necessary.

The advanced methods (which are somewhat similar to those outlined above), employed with such success by Mr. T. Fraser, of Dhulura, near Wagga, should be of interest to men on similar country. Mr. Fraser's property is on semi-alluvial reddish chocolate loam, on the bank of Holligan's Creek. He has frequently been successful in the Wagga crop-growing competitions, and in 1926 won the fallow competition. His methods are as follow:—The stubble is burned as early as possible. The land is then cultivated to a depth of 3 inches with the Wimmera scarifier, cutting about 8 feet wide with 6 inch points, ten horses being employed. The land is then cross-cultivated with the same implement, going to a depth of 4 inches; then harrowed immediately after. It is then left until June, when it is ploughed 3 inches deep, thus turning in a good growth of weeds, &c. If too wet to plough in June, the ploughing is carried out as soon after as possible. In September the land is cross-worked with the scarifier with 2-inch points, going to the full depth, thus bringing up all clods, &c., to the surface. The harrows immediately follow. In October the scarifier with 8-inch points, with the harrows attached behind, is used. The scarifier with knife bar attached is then used as required to kill paddymelons, &c. Mr. Fraser sows 80 to 90 lb. of graded seed, and 112 to 120 lb. of 22 per cent. superphosphate. Yields of over 40 bushels per acre have been produced on this property.

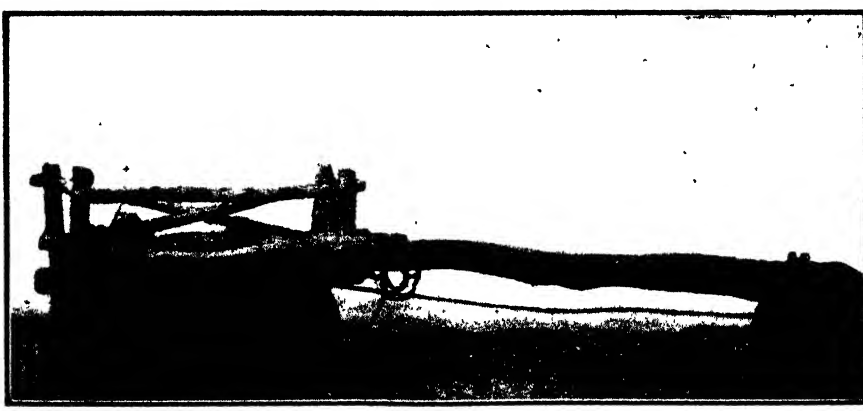
Heavy Clay Pug Soils.

Scattered throughout the South-western Slopes and Riverina are areas of particularly heavy clay pug soils. Although these soils are not very suitable for cultivation, wheat is to some extent grown on them, but only with the

greatest difficulty. These soils are extremely hard to work, and cannot be ploughed when either wet or dry. They must be just reasonably moist to be ploughed without undue trouble. Unfortunately this class of country is usually uneven, and when one portion is sufficiently dry to plough the remainder of the paddock will probably be too wet.

Typical areas of this pug country are to be found surrounded usually by belts of excellent wheat soil at Ariah Park. In many cases the adjoining land is friable and loamy.

A Farm-made Roller used for breaking down Mallee Scrub.



Another View of a "Mallee Roller."
It will be seen that the construction provides for a side pull.

Usually this class of country is used for grazing, but considerable areas of it are cultivated, and as it is so obstinate a few suggestions on its treatment should be valuable. It must be understood that although in certain seasons heavy yields are obtained from these soils, in normal seasons much time and patience, not to mention extremely heavy work, is required to get the land into a fit condition to grow wheat, and it is questionable

whether it is a paying proposition. There is no easy method of preparing this land. It must be ploughed fairly shallow (3 to 3½ inches) in winter; even when ploughed at the correct stage it turns up extremely cloddy. If ploughed when a little too wet the soil is so gluey that, as one farmer graphically describes it, "you could hitch a team to one end of a ploughed furrow and pull it clean out of the paddock." Summer fallowing cannot be practised, as a heavy rigid tine scarifier will not touch it, either wet or dry, and it cannot be ploughed in summer.

After being ploughed in winter the disc cultivator is generally used to break the clods up before the end of the winter. Then the scarifier or disc is used as required to kill weeds right up until sowing. Spiked rollers are used in the winter, spring, and autumn, but are not as satisfactory as the disc cultivator for breaking down the clods. In fact, the disc is the only implement capable of breaking down these clods, and if it is not used the land will be so rough and cloddy at sowing time that it will be almost impossible to sow it. The important points to remember are:—

(1) Plough as early in the winter as possible.

(2) Cultivate the fallow with a disc in late winter while the clods are still damp. If the cultivations are delayed until the dry weather sets in the clods will be too hard for any ordinary implement to break them down during the summer.

Heavy Black and Brown Self-mulching Soils.

Such soils are usually found carrying boree timber in New South Wales. They are generally crab-holey in the virgin state, but after a few years of cultivation the surface becomes more level. The soil, although a heavy clay, does not set hard on the surface. When wet it is extremely puggy and gluey, but on drying, instead of setting hard, like the majority of clay soils, the surface cracks up into small squares, and thus forms a natural mulch—hence the term "self-mulching."

This class of country is usually excellent for grazing, and in the past has been used almost entirely for this purpose. It was always regarded as being too difficult to work for wheat growing. Of late years, however, more attention is being given to the cultivation of this class of country, and the results already achieved have proved that, given correct methods of cultivation, it is exceptionally well suited to the production of heavy wheat yields.

These soils are easier to plough when dry. In fact, it is extremely difficult to get them ploughed during the winter, unless a dry winter is experienced. They should, therefore, be ploughed in summer, as soon after harvesting as possible. If the stubble is burnt as early as possible it will be found possible to plough these soils at this time of the year. A suitable depth to plough is 3½ to 4 inches. The land can then be harrowed immediately after ploughing. If the season is normal a good germination of weeds, black oats, &c., results, and sheep may be grazed until the land gets too wet in the winter. The springtooth cultivator or rigid tine scarifier may be used prior to the winter, going almost to the full ploughing depth. Do not

touch the fallow during the winter. In spring and early summer cultivate with the rigid tine scarifier as required to destroy weeds (going only 2 inches deep). If desired, a set of harrows may be drawn behind the scarifier. It is impossible to make the surface too fine; in fact, it should be the aim in working this class of soil to get the surface as fine as possible. No matter what the surface condition, it will not set hard after heavy rain, but will crumble up on drying. After every fairly heavy shower of rain from now on until seeding time it is advisable to harrow the fallow, unless the scarifier be substituted for any particular harrowing on account of weed growth. This frequent harrowing conserves a wonderful amount of moisture, and also brings about a really excellent consolidation of the sub-surface soil. I have noted fallows on this class of country where the harrowings have been frequent, and have found that even after a very dry spring and summer the sub-surface soil has been charged with moisture rising to within 3 inches of the surface of the soil. This frequent harrowing is one of the chief factors in obtaining maximum yields from this class of country.

These soils are somewhat similar to the soils found in the famous Wimmera district in Victoria (see *Agricultural Gazette,* December, 1924), and with them we may safely adopt many of the cultural methods practised in that district. We cannot, however, adopt their practice of sowing wheat as late as July, as our climatic conditions are quite different. We find it advisable to sow this class of land in April or early May. If sowing is delayed later there is a great likelihood of the soil becoming too wet to sow, and remaining so throughout the winter.

The practice of sowing the superphosphate in the autumn and afterwards broadcasting the seed at the correct sowing time, as adopted in parts of South Australia, has much to recommend it for this class of country, as it is so difficult to get it sown satisfactorily in the ordinary way. The system will be more fully discussed in connection with fertilisers*.

(*To be continued.*)

* In the next section of this article, various fallowing systems will occupy Mr. Clayton's attention.—Ed.

A Useful Function of the Agricultural Bureau.

Experiment Committees, as outlined at our conference last year, have become a distinct function of the Agricultural Bureau, and it is not now uncommon for a branch to be running as many as a dozen local experiments. This is perhaps the most valuable of recent developments in Bureau work, its value being indicated by the following figures from the North-Western District:—

In 1924 there were 3 branches running 12 Experiment Plots.

In 1925 there were 7 branches running 40 Experiment Plots.

In 1926 there are 27 branches each with its Experiment Committee, and over 300 experiment plots have been arranged.—W. E. Tayler, President, at the State Agricultural Bureau Conference.

Proportion of Grain to Sheaf in Wheat.

For some years the proportion of grain to sheaf in wheat has been worked out from the yields of small testing plots, and the following list is shown as affording a few interesting comparisons. A high proportion of grain to sheaf does not necessarily indicate a high grain yield per acre, though a low percentage does indicate that a variety is more suited for hay than for grain production—compare Zealand, Clarendon and Warren. The last two are rust-resistant and are suited for fodder in coastal districts, while Zealand is grown in the Riverina for hay.

The highest figure is shown by Gurkha, a wheat obtained from a cross between Yandilla King and the Indian wheat, Zaff. The quality of the grain is remarkable high, being rich in gluten, but the yield per acre is not sufficiently high to pay the farmer. Federation shows a high percentage, also Duri, which is closely related to Canberra. It is remarkable that Canberra should have only a medium proportion of grain to sheaf, considering that it is supposed to have been a hybrid between Federation and a barley. We can hardly now entertain this origin for the variety, as barleys have a higher proportion of grain to straw than wheats, and Federation itself is comparatively high in this respect. Cargo should be a good general purpose variety. Rymer and Marshall's No. 3 should have a higher average, and it must be said that the first sixteen wheats in the Cowra list are not strictly comparable. The remaining figures, however, are all from the years 1923, 1924 and 1925, while the Bathurst results are all from the years 1922, 1923 and 1925, and may be taken as quite uniform.

Proportion of Grain to Sheaf.

Cowra.				Cowra.			
Bunyip ...	... grown	3 years	·355	Union ...	... grown	3 years	·366
Canberra ...	,,	5 ,,	·359	Canaan ...	... ,,	3 ,,	·338
Federation ...	,,	5 ,,	·408	Exquisite ...	,,	3 ,,	·315
Roseworthy ...	,,	3 ,,	·375	Maharajah ...	,,	3 ,,	·353
Droophead ...	,,	4 ,,	·339	Fortune ...	... ,,	3 ,,	·346
Warren ...	... ,,	4 ,,	·306	Ford ...	... ,,	3 ,,	·357
Gluyas ...	... ,,	3 ,,	·354	Sultan ...	... ,,	3 ,,	·360
Yandilla King ...	,,	4 ,,	·350	Duri ...	... ,,	3 ,,	·398
Purple Straw ...	,,	3 ,,	·344	Boonoo ...	... ,,	3 ,,	·385
Marshall's No. 3	,,	3 ,,	·334				
Hard Federation	,,	3 ,,	·363	Bathurst.			
Newman's Early	,,	3 ,,	·342	Waratah	... grown	3 years	·384
Rymer ...	... ,,	3 ,,	·316	Barwang...	... ,,	3 ,,	·374
Clarendon ...	,,	3 ,,	·283	Gresley ...	... ,,	3 ,,	·387
Zealand ...	... ,,	3 ,,	·216	Canberra ...	,,	3 ,,	·351
Gurkha ...	... ,,	3 ,,	·493	Cadia ...	... ,,	3 ,,	·344
Canimbla ...	,,	3 ,,	·351	Coreen ...	... ,,	3 ,,	·367
Cargo ...	... ,,	3 ,,	·325	Comara ...	... ,,	3 ,,	·352
Wandilla ...	,,	3 ,,	·384	Canimbla ...	,,	3 ,,	·370
Bena ...	... ,,	3 ,,	·382	Cargo ...	... ,,	3 ,,	·334
Bredbo ...	... ,,	3 ,,	·389	Wandilla ...	,,	3 ,,	·392
Onas ...	... ,,	3 ,,	·363	Onas ...	... ,,	3 ,,	421

Short straw Indian wheats with slender stems have done well in the drier parts of the State, being early maturing. A small proportion of grain to straw may be a factor of value in breeding wheats for arid conditions, but in the main wheat belt a moderately high proportion of straw would seem to indicate strong constitution and a vigorous plant provided with ample material for the elaboration of plant food.—J. T. Pridham, H.D.A., Plant Breeder.

A Sheep Feeding Experiment with Lucerne and Maize.

This article presents certain results which were obtained during some feeding experiments with lucerne and maize at Trangie Experiment Farm. The work was placed by the Research Council of the Department of Agriculture in the hands of a sub-committee consisting of Messrs. Max Henry (Chief Veterinary Surgeon), F. B. Hinton (then Sheep and Wool Expert), J. N. Whittet (Agrostologist), R. G. Downing (Senior Experimentalist). The experiments are not commercial feeding experiments, but were carried out with a special object in view, and it is, of course, understood that no one, unless forced by untoward circumstances, would try to keep sheep so long on such a monotonous diet.

These experiments in hand-feeding sheep on lucerne alone and lucerne in combination with maize were commenced at Trangie Experiment Farm on 27th August, 1924. The point it was primarily sought to prove by this experiment was unfortunately not attained, but as the opportunity was taken to keep other data, some interesting information has been gleaned along various lines of inquiry. The experiment terminated on 8th August, 1925.

The sheep used in the experiment were Merino wethers between one and two years old at the commencement of the experiment. The sheep were kept throughout the whole period of the test confined in small pens in which naturally no green food had any opportunity to grow. The only occasion on which they were removed was to take them to the dip.

The pens were well shaded with wilga trees. There were forty sheep in the experiment, and they were divided into four pens of ten each. They had been selected as uniform as possible in weight and the class of wool they carried. They were shorn with machines immediately before the experiment commenced. With a few exceptions, these sheep carried bright wool of good character of a 64's count. The wethers were ear-tagged, and a description of each individual sheep recorded. The four pens were numbered A1, A2, B1, and B2 respectively. The daily rations fed to the different lots of sheep were as follows:—

A1—2 lb. per head of "A" lucerne hay and 4 oz. whole maize.
A2—3 lb. per head of "A" lucerne hay.
B1—2 lb. per head of "B" lucerne hay and 4 oz. whole maize.
B2—3 lb. per head of "B" lucerne hay.

In each case the daily lucerne ration was divided into three equal feeds; in the two pens receiving maize the maize ration was given in one feed in the morning.

"A" lucerne was of fairly good, even type all through the experiment, with plenty of leaf and but little weed, but "B" lucerne in the early months of the trial contained a good deal of weed and was much coarser in the stalk than "A." These coarse stalks were left to a considerable extent, and

this diminished the actual amount of foodstuff obtained by the sheep on "B" lucerne. The maize was of good quality, but in no way specially selected. During rainy weather, when the lucerne hay became saturated, there was considerable waste. The only other food obtained by the sheep was a few berries and leaves from the wilga trees. It is further of interest to note that apart from the changes in the wool noted below they suffered no ill-effects.

It is always questionable whether stock can be maintained in health on a single plant ration, but this experiment would tend to show that in the case of lucerne but little, if any, harm results to sheep.

Salt Lick.

A salt lick, consisting of a mixture of thirty parts Liverpool salt and two parts Epsom salts, was always available to the sheep. The quantities supplied to the end of the period of trial were as follows:—

A1—32½ lb. .. 1·43 oz. per day, or ·35 oz. per sheep per day.
A2—26½ lb. .. 1·16 oz. per day, or ·29 oz. per sheep per day.
B1—23½ lb. .. 1·03 oz. per day, or 25 oz. per sheep per day.
B2—28 lb. .. 1·23 oz. per day, or 30 oz. per sheep per day.

The cost of the lick supplied was 6s. 8d., or 2d. per sheep, for a period of very nearly twelve months. As the sheep were given all they would take, this is evidently about the limit of their requirements on the ration given. It cannot be taken as a criterion of what the requirements would be if grazing on natural grasses.

The water supply was pumped to a tank from a well, and was run off into troughs for the sheep.

Weights of Pens.

The following table shows the aggregate weight of each pen at various dates:—

Date.	Pen A1.	Pen A2.	Pen B1.	Pen B2.
1924.	lb.	lb.	lb.	lb.
27 Aug.	824·5	824	825	825
27 Sept.	810	801	833	823
27 Oct.	831	812	847·5	842
27 Nov.	829·5	825·5	829	812
29 Dec.	879·5	837·5	877·5	823
1925.				
24 Jan.	870	824	891·5	825
21 Feb.	877·5	834	899	812·5
21 Mar.	875	838	906	825
18 Apr.	934	853	947	852·5
16 May	953	857	956	844
13 June	949	867·5	985·5	841
14 July	871	810·5	893·5	738·5
8 Aug.	980·5	860	1000·5	867

The rainfall for the period was as follows:—

Month ending—	inches.	Month ending—	inches.
1924.		1925.	
27 Sept.	2·19	21 Mar.	·40
25 Oct.	2·13	18 Apr.	·18
27 Nov.	6·98	16 May	·91
29 Dec.	1·27	13 June	1·59
1925.		14 July	8·39
24 Jan.	2·29	8 Aug.	·10
21 Feb.	·71		

It will be noticed by referring to the above that during the very wet months ending 14th July, 1925, the pens receiving no maize ration dropped much more in weight than those receiving maize. This result would not be unexpected, since the heavy rain saturating the lucerne renders it unattractive to the sheep, but at the same time the fat content of the maize may reasonably be held to have assisted in bringing about this result by its action in maintaining body temperature. It is evident if A1 and A2 are compared, and also B1 and B2, that the 4 oz. of maize was more than equivalent in feeding value to the extra pound of lucerne.

Effect on the Wool.

The main points worthy of note under this heading are as follows:—

All the fleeces of the wethers at the commencement of the trial were of a 64's count, whereas at the conclusion of the trial it was found that 57 per cent. of the fleeces had fined considerably, being 70's and 80's, while 37 per cent. had fined only slightly, being 66's, and 6 per cent. had retained their original spinning count. However, under the regional climate conditions, such as are normal to the western plains, this fining up is not desirable. The climate in this locality is hot and dry, and the finer types of wool are unable to withstand these conditions. In all cases the wool from the lower portions of the legs and the belly wool was discoloured and poor in quality, probably due to the wet condition of the yards at times. A certain proportion of the fleeces showed a tenderness at the conclusion of the trial. At shearing time the proportions were as follows:—

A1—All sound.
A2—7 sound and 3 tender.
B1—9 sound and 1 tender.
B2—7 sound and 3 tender.

Effect on the Animals' Health.

Ophthalmia appeared among the sheep. After being treated with the undermentioned mixture once, all signs of the trouble disappeared. Mixture: Tincture of iodine 1 oz., potassium iodide 30 grains, distilled water 9 oz.

One wether was fly-blown on 23rd April, 1925, and again on 29th April. He was treated each time and drenched with Epsom salts and kept in the shed for a few days from 29th April, as he was in a very low state. Owing to a break in the wool this sheep was shorn with blades on 23rd May, cutting 5½ lb. of wool.

With these exceptions there was no sickness among the sheep.

Conclusions.

It is felt that the information gained during the experiment may be of interest in the following respects:—

The fact that Merino sheep could be kept so penned with so little ill-effect is of itself of interest, as is the fining of the wool under such conditions.

It appears definite that a mixed diet of maize and lucerne is preferable to a monotonous diet of lucerne, as is evidenced not only from the weights, but from the character of the wool, and under average prices it would be less costly. At the same time, the experiment shows that sheep can with very little ill result be kept on a monotonous lucerne diet for long periods.

It is remarkable that lack of exercise was not more detrimental.

The figures re the consumption of salt lick may be of some use as a guide to future action.

GRAIN SICKNESS IN SHEEP.

IT is anticipated at the time of writing that this season's wheat harvest will be a good one. In those portions of the State which are so well adapted to running sheep in conjunction with wheat-growing, losses in sheep are likely to occur after harvest, particularly in the case of young sheep.

Farmers should note that it is inadvisable to allow weaners and hoggets access to stubble paddocks after stripping, unless rain has fallen to germinate any grain which has been spilled. During the process of harvesting, especially in such a good season, no matter how much care is taken some grain is spilt on the headlands, at bag dumps, and from the machines.

It is the usual practice to turn the sheep into the stubble in order to spell the grazing areas (which should be done at every opportunity) but mortality is likely to ensue if the grain has not "shot."

The stomachs of young sheep have not the digestive capacity of older ones, and are unable to assimilate the abundance of grain which is very hastily gathered. In some remote cases, these young sheep may appear to show signs of "hoven," but the real cause of death is the grain. Older sheep running in similar paddocks will not suffer any ill effects, providing water is available.—H. N. WILDMAN, H.D.A., Asst. Sheep and Wool Instructor, Glen Innes Experiment Farm.

THE EXTENT OF OUR DEVELOPMENTAL RAILWAYS.

THE value of the railways to the State in assisting the development of the country is more clearly appreciated from a study of the number of lines that are worked solely in the interests of those who have settled in the far interior. There are now fifty-five of these developmental lines, with a total mileage of 3,586, the capital cost of which is £32,015,994. During the year ended June, 1925, the interest paid on these lines was £1,611,798, and as the net earnings amounted to only £106,788, they showed a loss of £1,505,010, which had to be made good from the revenue derived from the remainder of the system.—C. J. GOODE, Goods and Rolling Stock Superintendent, at the Agricultural Bureau State Conference.

Farmers' Experiment Plots.

Maize Trials, 1925–26.

Upper North Coast District

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

The following farmers co-operated with the Department in conducting maize experiments during the season 1925-26:—

H. Johnson, Condong, Tweed River.
C. Oliver, "Laureldale," Casino.
Miss Mitchell, Cawongla-road, Kyogle.
R. S. Perdriau, Fawcett's Creek, Kyogle.
M. McBaron, "Riverview," Raleigh.
R. W. Hindmarsh, "Wiaraga," Bellingen.
S. T. Walker, Deervale, Dorrigo.

The season was not very favourable to maize growing. In July and August, the prospects of a good season appeared to be very bright, but the complete change to dry conditions in September and October was somewhat severe on early-planted crops, and in many cases prevented further planting. With the closing of October excellent rains were again received, which permitted of the seed-beds for the late crops being brought into good condition for planting, and the ground being well supplied with moisture, good germination resulted. Excellent growth was made during the early stages, and the crops gave very satisfactory promise, but the extremely dry conditions and continuous high temperatures during February (at which period most late crops were tasselling) were not favourable to high yields. Thus it will be seen that the dry periods during September and October, 1925, and February, 1926, were responsible for light yields in both early and late crops.

Owing to unseasonable conditions, results were not obtainable at Fawcett's Creek, or at Dorrigo.

Rainfall during Growing Period.

	Condong.	Casino.	Kyogle.	Raleigh.	Bellingen.
	points.	points.	points.	points.	points.
September, 1925	...	...	...	61	...
October, "	117	...	...	120	115
November, "	688	...	...	782	963
December, "	823	535	218	602	736
January, 1926	299	840	654	543	564
February, "	14	Nil.	97	106	200
March, "	571	155	240	1,005	856
April, "	1,169	260	441	605	347
May, "	...	300	326	...	404
June, "	...	...	128	...	...
Total	3,681	2,090	2,104	3,824	4,185

Cultural Details.

Condong.—Black peaty soil, situated in what is generally known as the Condong Plain; previous crop sugar-cane (ratoon crop). The land was ploughed immediately the cane was cut in August, and then disced and cross-disced; second ploughing followed by the harrow was given just before planting. Planting was carried out on 20th November, with the maize dropped in drills 4 feet apart. All plots were harvested on 21st April.

Casino.—Heavy black volcanic soil; previous crop winter cereals for green fodder. Land ploughed in November and harrowed. Planted 9th December by opening drills with a plough 4 feet apart and dropping seed by hand. Harvested 11th June.

Results of Variety Trials.

Variety.	Condong.		Kyogle.		Casino.		Raleigh.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Leaming	45	38	...		...		38	18
Broad Leaming	39	44	...		...		33	50
Funk's Yellow Dent ...	32	23	...		...		36	47
Golden Superb	35	20	...		...		16	11
Golden Beauty	32	23	51	35	25	30	...	
Iowa Silvermine	19	9	...		...		31	27
Craig Mitchell	23	32	...		...		19	9
Funk's 90-day	22	6	...		...		...	
Kennedy	22	6	...		...		...	
Yellow Hogan	...		52	52	24	31	...	
Fitzroy	...		48	20	20	30	..	
Pride of Hawkesbury ...	...		41	46	25	30	...	
Large Red Hogan	...		42	27	15	40	...	
Whitecap Horsetooth ...	...		...		19	36	...	
Ulmarra Whitecap	...		...		18	37	...	

Results of Fertiliser Trials.

Fertiliser per acre.	Condong		Kyogle.		Raleigh.		Bellingen.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Superphosphate, 182 lb. ...	44	11	47	39	48	35	87	17
*M1, 238 lb....	47	8	60	14	47	8	73	9
*M2, 224 lb....	47	8	50	12	44	11	58	17
*P7, 168 lb.	44	11	45	11	47	8	64	53
Blood and bone, 224 lb. ...	41	14	40	10	48	35	63	41
No manure	45	38	35	8	38	18	71	25

* M1 mixture consists of thirteen parts superphosphate and four parts sulphate of ammonia; M2 of thirteen parts superphosphate and three parts sulphate of potash; P7 of equal parts superphosphate and bonedust.

Kyogle.—The soil on Miss Mitchell's farm is a heavy black (pug) volcanic soil of basaltic origin. The crop preceding the variety trial was cotton, while the manurial trial was planted on old maize land which had been under cultivation for some years. Ploughing was carried out in September, and

springtooth cultivations were given twice in November, and once in December. The maize dropper was used in planting, which took place on 10th December, in rows 4 ft. 6 in. apart. Harvested 10th June.

Raleigh.—Soil, black alluvial loam; previous crop maize. Ploughed in May, August and September, and harrowed before planting. Sown 16th September with maize dropper in drills 4 feet apart. Harvested 12th May.

Bellingen.—Soil, black alluvial loam; previous crop field peas. Land disc-harrowed, ploughed and harrowed end of September. Planted 7th October with maize dropper in drills 4 feet apart. Harvested 21st May.

Maize Fertiliser Trial at Tumut.

A maize fertiliser trial was planted on Messrs. Butler Bros.' property at Bombowlee, Tumut, last season. The soil was rich alluvial loam, subject to flood, which had been growing maize for over forty years. A good growth of spotted trefoil and white clover was ploughed under early in October, the land was then rolled, harrowed twice and rolled again. Early Clarence maize was planted on 15th October, the rows being 4 feet apart and three or four grains were dropped every 32 inches in the drills.

The germination was good. The crop was scarified on 24th November, and again on 12th December.

The summer was particularly dry and the maize crops at Tumut suffered severely. On the experiment area the yields were low and undue importance should not be attached to them. Harvesting took place on 26th April, the results being as follows:—

Fertiliser.	Yield. bush.	lb.
*M 13 at 236 lb per acre	29	47
Superphosphate 182 lb. per acre	24	2
No manure	21	22
†M 4 at 250 lb per acre	21	17

* M 13 consists of ten parts superphosphate and three parts sulphate of potash.
† M 4 consists of two parts sulphate of ammonia and five parts of superphosphate.

—E. S. Clayton, Senior Agricultural Instructor.

Instruction in Bee-keeping.

The Department has completed arrangements for holding the usual summer school in apiculture at Hawkesbury Agricultural College. The school will be run from 5th to 21st January, and will be open to applicants of either sex over sixteen years of age. A fee of £4 4s. (including board and lodging) will be charged for the course of instruction, which will cover all branches of practical work, and include a series of lectures dealing fully with the various aspects of bee-keeping.

Prospectus and application forms may be obtained from the Under Secretary, Department of Agriculture, Sydney, to whom all inquiries should be addressed.

Championship Winter Fodder Crop Competition.

A Movement Initiated by the Lower North Coast Bureau Branches.

H. C. STENING, H.D.A., Chief Instructor of Agriculture.*

THE initial step in the holding of championship competitions for growing crops of winter fodders has been taken by branches of the Agricultural Bureau situated in the Lower North Coast district. Local competitions were conducted by four branches, namely, Bandon Grove, Bulby, Dumaresq Island, and Taree Estate, the winning crop of each competition becoming eligible to compete for the championship. The movement has thus been successfully inaugurated in this district, and the keen interest and enthusiasm displayed presage well for the entries next year. Other branches of the Bureau in the district have already signified their intention of holding competitions.

From this beginning it is to be hoped that in the interests of the dairying industry this spirit of rivalry will spread throughout the coastal districts, for crop competitions can exert no less a beneficial influence on methods of cultivating fodder crops in the coastal districts than they are doing in the case of wheat crops in inland districts, with the further advantage that their results should lead to a more general recognition of the great value of providing green fodders for dairy cattle during the winter months. In the past, dairy-farmers, with a few exceptions, have relied mainly on the natural pastures for feed and have made no provision whatever for the maintenance of the condition, much less the milk and butter production of their dairy herds in periods when pastures are sparse, as is generally the case in late winter and early spring. Progressive farmers, however, are now realising the importance of providing fodder to supplement the pastures during periods of scarcity, and rather than depend on conserved fodder for this purpose they prefer to maintain a succession of green fodder crops. It is at the end of winter (August and early September) that the "pinch" is mostly felt. For the supply of green fodder at this period such crops as oats, barley, wheat, field peas, and vetches "fill the bill," and it is the aim of the competitions to stimulate the cultivation of this class of crop. The provision of fodder crops at this time of the year is calculated not only to result in the maintenance of the condition and also the milk and butter production of the dairy herds over the period of feeding, but it will tend to increased production during the early summer months, by reason of the fact that the pastures will be utilised for the purpose of producing milk instead of restoring the condition lost during the winter, and also on account of the improvement of the pastures resulting from being spelled when the early spring growth is being made.

* Mr. Stening acted as judge in the Championship Competition, this article constituting his report.

The seasonal conditions were not very conducive to the production of high yields of fodder. For the growing months, April to August, the total rainfall was 20 inches at Taree and 16 inches at Dungog; these registrations were in excess of the average for this period, but the distribution was unsatisfactory, excessive rains alternating with periods of deficiency. A lower rainfall of 12 inches for the growing period was received at Bulby. The greatest disadvantage of the weather conditions was the very heavy rains of over 7 to nearly 9 inches in March, which considerably hindered the satisfactory preparation of the land and delayed sowing.

The crops eligible for the championship were inspected on 31st August to 2nd September and were judged on the scale of points adopted by the Bureau. The conditions as to area are that there must be evidence of at least 2 acres of fodder crops having been grown, and that at least ½ acre in one block is submitted for judging.

The Champion Crop.

The championship is awarded to Mr. J. P. Mooney, of Dumaresq Island, for a dense crop of Sunrise oats, standing 5 feet high and just coming into ear. The average yield per acre computed from the actual weight of a portion of the crop was 19 tons 11 cwt. The stems were green to the base, and green flag was carried well down the stems. The land, which was an alluvial flat on the Manning River, had grown eight crops previously, the last of which was potatoes. It was ploughed 12 inches deep and twice harrowed in January, ploughed 6 inches and disced twice in March, and ploughed 5 inches and twice harrowed just before sowing. Seed was sown on 28th April at the rate of 1⅓ bushels per acre, and an application was made of 1 cwt. of blood and bone per acre. On 26th May the crop was top-dressed with nitrate of soda at the rate of 30 lb. per acre.

The success of this crop can be largely attributed to the judicious cultivation of the land in preparation. By performing the initial ploughing in January, the crop benefited from the three months fallow by reason of conserved soil moisture, increased nitrates, and an ideal seed-bed.

Advantages of a Combined Crop.

In allotting points for suitability of fodder, ecouragement is given to the provision of a "balanced ration" by the growing of a combined crop of legumes and cereals. Vetches had been sown with three of the crops judged, but the season evidently had not favoured the growth of the legume, and very little consideration could be given to its proportion in the mixture. Vetches are usually preferred to field peas for the reason that they are more relished by stock. Oats are regarded as the best of the cereals for fodder purposes, and this was the crop submitted for the championship in every instance except at Bandon Grove, where Sunrise oats were combined with Gresley wheat. The advantages of this combination are (1) a higher yield by reason of the differing root systems of the two crops placing different portions of the soil under tribute, and (2) the prevention of lodging. The latter point was emphasised by the badly-lodged condition of a Sunrise oat

crop growing alongside and sown under otherwise similar conditions to the mixed crop, which was standing well. Sunrise is the most popular variety of oats for fodder owing to its high-yielding capacity and early maturity; this season the record yield of 23 tons 14 cwt. per acre has been returned by this variety on experiment plots in the Camden district. While the coastal farmers require a succession of crops, they desire as a rule to make only one sowing. Fortunately, there are now available varieties of oats with different periods of maturity which will fit in with this practice, and a succession of fodder can be maintained by sowing at the same time the new early maturing variety Buddah, Sunrise, Belar or Guyra, and the late maturing Algerian.

Rust made its appearance in the middle of August in some of the crops growing on river flats, evidently as the result of the abnormally mild conditions and absence of winds for that time of the year, but its development was checked by more seasonable weather at the end of the month. The time of sowing of the competition crops varied from 15th April to 14th May, which is rather late for the best results, sowing having been delayed by heavy rains; the end of March or early April is considered the best time for sowing.

The quantity of seed sown per acre was from 1½ bushels to 2 bushels per acre, while the former is a satisfactory rate for crops on alluvial flats, a seeding of about 2 bushels per acre is required for best results on less fertile soils. An application of at least 1 cwt. superphosphate per acre will greatly benefit the crop, resulting in an increased yield and earlier maturity.

One of the objects of the competitions is to indicate what are the best cultivation methods under varying conditions, and a crop capable of returning over 20 tons of green fodder per acre during a period of scarcity is deserving of special attention to every detail.

DETAILS of Award.

Branch of the Bureau.	Name and Address of Competitor.	Variety.	Date of Sowing.	Quantity of seed per acre.	Fertiliser per acre.	Suitability of fodder. Max., 30 pts.	Stooling capacity and thickness of stand. Max., 15 pts.	Period of Maturity. Max., 15 pts.	General appearance. Max., 15 pts.	Leafiness and greenness. Max., 15 pts.	Freedom from disease and weeds. Max., 10 pts.	Yield. 2 pts. per ton of fodder per acre.	Total points.
				bus.									
Dumaresq Island.	J. P. Mooney, "Wicklow," Dumaresq Island.	Sunrise oats	28 April	1½	Blood and bone 1 cwt., top-dressed with 30 lb. nitrate of soda, 26th May.	20	12	13	12	12	7	39	115
Bandon Grove.	Alex. Smith, "Willow Grove," Bandon Grove.	Sunrise oats and Gresley wheat combined.	15 „	1½	100 lb. superphosphate.	20	18	14	9	14	9	34	118
Bulby ...	J. J. Milligan, Bulby.	Mulga oats	19 „	1½	1½ cwt. superphosphate.	20	11	14	14	14	9	25	107
Taree Estate.	G. E. Levick, "Mulgrave Farm," Taree	„ ...	14 May	2	Nil.	20	13	9	8	14	8	29	101

Farmers' Experiment Plots.

Maize Green Fodder Experiments, 1925-26.

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

EXPERIMENTS were conducted on the South Coast during the 1925-26 season in fertilising maize with different classes of superphosphate to determine their value as affecting the yield of green fodder. The following farmers co-operated with the Department in establishing the plots:—

L. B. Garrad, Milton.
A. Chittick, Kangaroo Valley.
R. W. Jobson, Dapto.
J. Richardson, Jamberoo.
J. W. Childs, Camden.
G. H. Faulks, North Yarrunga.

The plots were sown during October, November, and December. Dry weather conditions prevailed during this time and continued right on to the middle of March, 1926, when good rain fell.

The seed was sown by means of the maize planter on all plots, the rows being 2 feet 9 inches apart and the grains dropped 5 or 6 inches apart, using about 25 lb. of seed per acre. The variety of maize used was Fitzroy. At North Yarrunga Hickory King, a variety popular with some local dairy farmers, was also sown. The fertiliser was sown at the same time as the seed—ordinary superphosphate and basic superphosphate at the rate of 2 cwt. per acre, and high-grade superphosphate at 1¾ cwt. per acre. The germination of the seed was satisfactory on all plots, but the only plots on which the growth was worth recording were those shown in the accompanying table. The dry weather conditions were responsible for the failure of the others.

At Camden, for instance, where careful preparations were made for the crop, the plants were so withered and parched at the beginning of March that it was decided to feed them off and plough the ground preparatory to sowing for an early crop of oats. The sorghum plots adjacent to this plot stood up to the dry weather conditions better and eventually pulled through, giving fair returns and demonstrating the ability of sorghum to withstand dry weather conditions as compared with maize. The plots were sown under the same conditions.

The returns from the maize plots do not reveal anything outstanding as regards the effect of the fertilisers.

The soil conditions at Kangaroo Valley, which were uniform, judging by surface indications, proved irregular; they were no doubt influenced by subsoil drainage, the land being built up by sediment from sandstone and basalt formations.

At Milton the plot was on sandstone formation situated on a hillside outside the paddock. Bracken fern cumbered the ground. The returns suggest that the effect of basic superphosphate might be more closely watched in future.

The soil of the Dapto plot was also formed from sandstone, but carried more humus than the Milton plot. Unfortunately the basic superphosphate plot was not sown owing to a shortage of seed occasioned by leakage in transit.

The recorded yields were as follows:—

Fertiliser per Acre.	R. W. Jobson, Dapto. Sown 29th Nov., Harvested 26th Mar.	L. B. Garrad, Milton. Sown 20th Dec., Harvested 10th May.	A. Chittick, Kangaroo Valley. Sown 22nd Oct., Harvested 15th April.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
High-grade superphosphate, 1½ cwt.	19 16 1 0	13 4 1 4	22 2 3 12
Superphosphate, 2 cwt.	17 7 0 16	15 0 0 0	20 14 1 4
No manure	14 8 2 8	9 14 1 4	22 5 2 24
Basic superphosphate, 2 cwt. ...	....	24 0 0 0	24 0 0 0

TUBERCLE-FREE HERDS.

THE following herds of cattle have been submitted to the tuberculin test by Government Veterinary Officers or approved veterinary surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd:—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
Department of Education ..	Eastwood Home ...	......	10	7 Nov., 1926.
Do do ...	Hurlstone Agricultural High School.	......	47	23 Nov., 1926.
Do do ..	May Villa Homes ...	......	6	8 Jan., 1927.
Do do ...	Yanco Agricultural High School.	......	29	14 Jan., 1927.
Walter Burke	Bellefaire Stud Farm, Appin.	Jersey..	36	19 March, 1927.
Department of Education ...	Gosford Farm Home	......	32	16 April, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
William Thompson Masonic Schools.	Baulkham Hills ...	......	33	15 June, 1927.
Department of Education ...	Mittagong Farm Homes.	......	33	7 July, 1927.
Hygienic Dairy Company ...	Glenfield Farm, Casula, Liverpool.	......	113	15 Sept., 1927.

—MAX HENRY, Chief Veterinary Surgeon.

The "Alkali" Soil Problem.

ERIC S. WEST, M.Sc.Agr., Research Officer, Commonwealth Citrus Research Station, Griffith.

"ALKALI" troubles are as old as irrigation itself. Within recent years much scientific research has been directed towards the solving of the problem, especially in the western States of America, India, and Egypt.

The term "alkali" to designate the condition of a soil brought about by the excessive accumulation of soluble salts is unfortunate. Chemically, alkalies are a very definite class of compounds, which are caustic, and generally have properties opposed to acids, which they neutralise, forming salts. True alkalies never occur in the soil. The term "salt," frequently employed in Australia, is to be preferred, as all the injurious substances occurring in the so-called "alkali" soils are true salts in the strict chemical sense of the word.

The Causes of Salt Injury.

Osmotic Phenomena.—Salts may be harmful in several ways, but the injury due to the phenomenon of osmotic pressure is the most harmful. When a fresh seedling is taken from the soil, its roots, stem, and leaves are crisp and more or less rigid, owing to the fact that they are full of cell sap, or, in other words, they are turgid. If, however, the seedling is thrown on to a hot pavement it will soon lose water and wilt. The same result can be brought about by placing the seedling in a brine solution. A fresh, crisp seedling placed in a solution of salt will soon become flaccid, the cause in both cases being the removal of water from the seedling. When a seedling is growing normally in the soil, the concentration of its cell sap is greater than that of the soil water surrounding its roots, and, because of this water, tends to pass into the roots, and thus keeps the plant turgid. If, however, the concentration of the water surrounding the roots is greater than that of the cell sap, as is the case in a salt soil, or when a seedling is placed in a solution of brine, water passes out of the plant into the surrounding solution and the plant wilts. In this case, we say that the osmotic pressure of the solution surrounding the plant is greater than that of the cell sap.

Osmotic pressure may be explained in another way. When any solid, such as salt or sugar, dissolves in water, minute particles, known as molecules, leave the solid to enter the fluid, and the magnitude of the osmotic pressure depends entirely on the number of molecules present, regardless of their kind (whether salt or sugar molecules). The injury of salts due to osmotic pressure is dependent on the magnitude of the pressure, and not on the kinds of salt present.

Plant Poisons.—Apart from the injury due purely to osmotic phenomena many salts, such as magnesium salts are actual plant poisons when present in excessive amounts. Then again, certain salts, such as sodium carbonate (washing soda), although actually not true alkalies in the strict chemical sense of the word, form an alkali when dissolved in water, and thus for all practical purposes may be considered as such. Both a high soil acidity and a high soil alkalinity are poisonous to the plant, but the latter is the more serious. For this reason, therefore, sodium carbonate is very poisonous to plant growth, being in fact the most toxic of all commonly occurring salts. Apart from its effect on the plant, this salt, in common with true alkalies, is very injurious because of its action on the physical condition of the soil. If a little soil is shaken up in water a muddy suspension is obtained; on addition of an acid or salt (such as gypsum) it will be noted that the particles of clay run together, forming little aggregates which soon sink, leaving a clear liquid. It was stated before that the properties of alkalies were opposed to those of acids, and in this respect their action on the soil is no exception, for the addition of an alkali to the clarified liquid will cause the clay particles to again separate, and when shaken the water will become muddy, and the particles will not settle.

In a soil of good tilth, the clay particles are grouped together in aggregates, and the soil is more or less porous, which explains the action of gypsum in the soil, the gypsum causing the clay particles to form aggregates, thus making the soil more open. "Alkalies," such as sodium carbonate, however, have the opposite effect—puddling the soil, causing it to decrease in volume and become almost impervious to water.

Besides having this physical effect, "alkali" dissolves out the organic matter of the soil, giving the soil a black colour; hence, when sodium carbonate is present one observes sunken black depressions almost impervious to water, and absolutely sterile.

Salts Commonly Present.

Generally speaking, the chief salts present in salt soils are the chlorides, carbonates, bi-carbonates and sulphates of soda, lime and magnesia.

Sodium chloride or common salt is almost universally present, and usually predominates. One would expect this to be the case, as this is the chief salt present in the ocean and inland salt lakes, the salt in these cases having been derived, of course, from the continual leaching of the land since the world began.

Sodium sulphate is also generally present, but usually to a less extent than the former. In parts of Wyoming and Colorado, U.S.A., it predominates, sometimes to the exclusion of all other salts. It is efflorescent, *i.e.*, it has the property of drying out or giving up its moisture to the atmosphere; thus if one end of a wick is placed in a solution of this salt, the other end will very soon become coated with a thick deposit of the crystalline material. On account of this property it coats the clods of soil of salt lands, and is

mainly responsible for the white efflorescence often observed. It is not nearly so toxic as sodium chloride, being in fact the least toxic of all injurious salts. In Wyoming and Colorado some soils are covered with such a thick deposit of this salt as almost to resemble snow, and yet they are capable of growing good crops, the reason being that most of the salt present is sodium sulphate, which, while coating the clods and making the soil look very saline, is actually not very toxic.

The chlorides of lime and magnesia are deliquescent, that is, they have the property of absorbing water from the atmosphere (contrast sodium sulphate). If a lump of dry calcium chloride is left exposed to the air it will soon absorb so much water that it dissolves in the water so absorbed, and instead of a dry lump we get a "blob" of liquid. It is because of these salts that many salt lands constantly remain damp, a very familiar phenomenon.

Magnesium sulphate (Epsom salts) is also generally present to a certain extent, and is fairly toxic.

Sodium carbonate (washing soda) is the most toxic of all salts commonly found in the soil, on account of its alkaline properties, and when present gives rise to "black alkali." The bi-carbonate of soda (cooking soda) is very similar in its properties, but it is not quite so harmful. Fortunately, large amounts of the carbonates of soda are rarely present in Australian soil, and black alkali is not, therefore very common.

The Complexity of the Problem.

The question of the relative tolerance of different plants to salt lands is exceedingly complex, owing to the number of variable factors concerned. In the first place the salts vary among themselves in their toxicity, sodium carbonate often proving to be about five times more toxic than any of the others, while sodium sulphate is only slightly toxic, and calcium sulphate (gypsum), being only sparingly soluble, is probably never toxic. An approximate order of toxicity of common soil salts is as follows: Sodium carbonate, sodium bi-carbonate, magnesium chloride, magnesium sulphate, sodium chloride, calcium chloride, sodium sulphate and calcium sulphate. It is to be noticed that the soluble carbonates and bi-carbonates are the most objectionable, followed by chlorides and sulphates. Magnesium salts are more toxic than corresponding sodium salts, followed by the salts of lime.

The problem is further complicated by a peculiar phenomenon known as the "antagonism of ions." Magnesium chloride is very toxic when present as a pure solution, but the addition of a small quantity of calcium chloride (itself toxic) vastly increases the tolerance of plants to the former. In the same way magnesium antagonises the effect of calcium, and sodium of either calcium or magnesium, and in general the presence of one salt antagonises the toxic effect of another. If therefore, we have three vessels of water of equal capacity, and in one dissolve enough calcium chloride and

in the second enough magnesium chloride to prevent the growth of a wheat seedling, and in the third vessel dissolve both salts in the quantities used in the other vessels, instead of being twice as toxic, as one would expect, wheat seedlings would grow quite normally in it.

It is thus seen that the toxicity of saline soils varies not only with the kinds of salt present, but also with their relative proportions, of which an infinite number of combinations are possible.

The class of soil is a further complication, for generally speaking plants are more tolerant of salts in heavy classes of soils, such as clays and clay loams or soils rich in organic matter, than in the lighter types, such as sands and sandy loams, and this for several reasons. In the first place the first mentioned classes of soil require a higher water content for plant growth than the latter; therefore, with the same quantity of salt present, the concentration of the soil solution is less, and consequently not so toxic. The problem is not so simple as this, however, because, if the amount of salt present in the two classes of soil is so adjusted that the concentration of the soil solutions are the same, it is found that even then the salt is less toxic in the heavy soils or soils rich in organic matter than in the lighter classes of soil; in fact, plants will not tolerate the same concentration of salt in a water culture* free of solid material as they will when solid material is present, even if the latter be pure quartz sand. Apparently the presence of solid particles has an important influence, and not only is this so, but the size of the solid particles is important; the finer the particles the more tolerant the plant, which accounts for the greater injury to plants in sandy than in heavy soils or those rich in organic matter. The question is bound up in the absorption phenomena of colloids, clay and humus soils having a high colloid content.

Although generally speaking salts are more toxic in light than in heavy soils, in the case of sodium carbonate (black alkali) the reverse is the case, owing to the bad effect of this salt on the physical condition of the soil.

Salt may be concentrated in certain layers, and is then more harmful than when evenly distributed throughout the soil, as in these layers a very concentrated solution exists.

The kind of crop grown is also a factor to be considered, as plants not only vary in their tolerance to any given salt, but the order of their tolerance is often different for different salts or for different combinations of salts. Thus, under one set of conditions of soil and salts present, wheat may prove more tolerant than barley, while under another set (which is more usual) barley is more tolerant than wheat.

It is thus seen that the kinds of salts present, their relative proportions, the phenomenon of antagonism of ions, the class of soil and its moisture content, type of plant grown, and its age, the distribution of the salt in the

***It is possible to grow plants to maturity in water culture, *i.e.*, in solutions containing the nutrient salts essential to plant growth.**

soil, &c., all tend to make the problem very complex. In spite of this, Loughridge, an early Californian investigator, prepared tables showing the tolerance of different plants to various salts when present in the soil.

Generally speaking, citrus trees are among the most susceptible to alkali injury, lemons being more susceptible than oranges. Grape vines generally prove more tolerant than stone fruits, while plants of the *Chenopodiaceae* family are among the most tolerant. This family includes such well-known members as the salt bushes (*Atriplex* spp.) fat hen (*Chenopodium album*), beets (*Beta*) including sugar beet, silver beet, and mangels, &c., Roly poly (*Bassia quinquicuspis*) and samphire (*Salicornia*). Some of these plants are useful as being those that may be grown commercially in soil too salt for other crops (in this connection it is recalled that in Europe salt is often used as a fertiliser for mangels), while others, though of no economic importance, are useful as being "salt indicators" when present in the native flora, plants of this family often occurring to the exclusion of all others on salt lands. Mature lucerne is also very tolerant, but in the seedling stage is very susceptible to salt injury. Date palms sometimes prove extraordinarily resistant, but are of little concern to us.

Origin of Saline Soils.

Saline soils owe their origin to various causes:—

(1) *Former geological formations*, such as the drying up of inland seas or arms of the ocean at some previous geological period. As an example of this may be cited the salt lands of Utah, U.S.A., the salt in this case having been derived from the drying up of the huge Lake Bonneville, which existed in past geological times, and of which the Great Salt Lake is a remnant. The salt in this region is, therefore, mainly sodium chloride, of which a large amount may be present in the virgin soil.

In parts of Wyoming and Colorado the shale from which the soil has been derived contains pyrites (sulphide of iron), and during the processes of soil formation by the weathering of this rock the pyrites are converted into sodium sulphate. For this reason the salt in this region, as mentioned before, is mainly sodium sulphate.

(2) *Irrigation Water.*—If the irrigation water that is used has a high saline content the salt may accumulate in the soil after repeated irrigations to such an extent as to become harmful, although the amount of salt in the water may not be sufficient to be immediately harmful. It is difficult to arrive at a figure showing the danger limit of salinity in irrigation water. Hilgard, a pioneer in this work, set the limit at about 50 grains to the gallon, while other authorities consider up to 100 to 200 grains per gallon may be present with safety, but it must always be borne in mind that if sodium carbonate is present in the water much less quantities of total salts will prove harmful.

Rivers in arid countries usually are more saline than those of humid countries. For example, Australian rivers generally contain more dissolved matter than those of Europe. The composition of the water varies with the season; in flood time rivers carry very little dissolved material, although they carry much more solid material in suspension in the form of sand and silt. Generally speaking, rivers arising from mountains, especially if fed by snow, are very pure. Fortunately, the Burrinjuck dam ensures a good supply of fresh water at all times to the Murrumbidgee Irrigation Area.

(3) *Concentration of Salts already present.*—This is the chief cause of salt trouble. During the processes of soil formation from rocks, soluble salts are formed which are valuable as mineral plant-foods. The greater part of this salt is washed out of the soil and carried by rivers to the ocean, where it has been accumulating since the world began, which accounts for the salinity of the sea. In wet localities there is a greater tendency for the salts to be leached from the soils than in arid regions, where a relatively high percentage of salt is consequently usually present in the soil. This accounts, to a great extent, for the proverbial fertility of arid soils in contrast to humid soils, where the deficiency of salts has usually to be made up by the application of artificial fertilisers.

The relatively high percentage of salt normally found in arid soils is quite harmless; in fact, it is beneficial so long as it remains evenly distributed throughout the soil. When large quantities of irrigation water are applied, however, there is a tendency for the salt to accumulate in specific layers. Under these conditions water rapidly evaporates from the surface of the soil owing to the high evaporation of the locality, and fresh water rises by capillarity from below, bringing with it the dissolved salts and depositing them near the surface where evaporation is going on. This salt, however, may be washed down into the lower layers when water is again supplied to the soil. We thus find two opposing factors at work. The percolating irrigation water washes the salt down, while the capillary rise to the surface brings it up. The latter effect, however, is the more marked, as percolating water goes down through the larger spaces of the soil, such as worm burrows, cracks, &c., and dissolves very little salt in its passage, but the water rising by capillarity does so through the finer interstices of the soil, dissolving the salt and bringing it to the surface. The result of these interactions is the accumulation of salts near the surface, and any treatment which will decrease the evaporation from the surface soil (such as the creation of a surface mulch or the shading of the soil by the growth of lucerne) will counteract this.

It is well to note that the accumulation of salt takes place where the greatest evaporation is going on, and this is usually near the surface, but is not necessarily always at the surface because the soil water may evaporate into the soil atmosphere below the surface. In fact, the exact position of the zone of greatest salt accumulation is the resultant of the two opposing tendencies of the percolating water and capillary rise, which wash down and bring up the salt respectively.

The concentration of salt may be considerably increased in a similar manner in any particular position of the soil where lateral seepage from ditches takes place, when salt will accumulate where the water is continually evaporating from the surface of the soil, even if the water in the ditch is not at all saline. In this case the salt naturally present in the soil through which the water percolates becomes concentrated where the water evaporates.

The Danger of a High Water Table.

A high water table* is one of the chief causes of the accumulation of salt in the soil. When the water table is so high that it permits the water to rise to the surface by capillarity the salt in the soil will very quickly become concentrated near the surface where the water evaporates. Besides the indirect injury in causing the accumulation of salts, a high water table is directly injurious, as it is impossible for roots to penetrate a water-logged soil, and if the water table rises in the soil the roots of trees already established will be killed. In irrigation practice the water table should therefore be closely watched and never allowed to remain near the surface.

Pockets of Soil of a Different Texture or Structure.

Pockets of soil of a different texture or structure from the surrounding soil are often the cause of salt spots. Isolated patches, varying in area from a few square yards to a square chain, are found in which the soil is deeper, more permeable to water, and has a greater capillarity (considering both the rate and height of capillary rise) than the surrounding soil, and they therefore absorb much more irrigation water and remain damper at the surface for a greater length of time, which leads to the accumulation of salt. Such spots often owe their origin to rabbit warrens which have been levelled down in grading operations, and are due to the work of the rodents. In places where large trees have been grubbed out of the soil the same condition obtains. The accumulation of organic matter in these cases is probably also a factor in bringing about the physical conditions referred to above. Such salt

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* It is as well, perhaps, to explain the term "water table." The gravity water of the soil, *i.e.*, the water in excess of that held by capillarity, slowly sinks until it reaches an impermeable stratum, where it accumulates, saturating the soil or rock, and is manifest by wells. The surface of this saturated zone, corresponding to the level of the water in wells, is known as the water table.

After a heavy application of water to the soil the surface layer becomes saturated, and this zone of saturation, which may be regarded as a "local water table," gradually moves downwards. In heavy soils the downward movement may be very slow, and if irrigation is frequent and excessive a local water table or saturated zone may be kept continuously near the surface.

A local water table is necessarily produced during every irrigation, as, in order that irrigation water may reach the lower layers, it is necessary to saturate the surface. So long as the zone of saturation moves down reasonably quickly, the excess gravity water, disappearing beyond the root feeding area, and not being reformed at or near the surface by a second irrigation before this has time to happen, no harm results. In fact, it may be beneficial in forcing a circulation in the soil atmosphere, but if the local water table is kept near the surface for extended periods, it is just as harmful as a high permanent water table.

patches are quite common, and are very annoying, as it is difficult to deal with them. It is practically impossible not to over irrigate them and at the same time to water the rest of the field sufficiently; their situation generally makes tile draining out of the question. It is to be noted that the physical conditions of the soil in these patches are desirable from the point of view of fertility when they refer to the soil as a whole. It is only when small isolated patches of soil of such a nature occur that trouble results. If the top 24 inches of the soil of the whole field is mixed up, as in deep ploughing, to this depth, which practice is adopted on the Murrumbidgee Irrigation Areas at times, the soil is greatly improved.

It is usually noticed that the soil bordering a salt patch carries better herbage than that surrounding. The salt, which contains the mineral plant-food of the soil, is more concentrated here than in the surrounding soil, but not sufficiently to be harmful; in other words, the soil is better fertilised. Besides this, the soil in the locality has a better, though not excessive water supply, owing partly to the presence of deliquescent salts, such as the chlorides of calcium and magnesium, and sometimes partly to the fact that the water table is close to the surface, but has not yet caused a sufficient accumulation of salt to be harmful. Thus salt patches are usually barren in the centre, and surrounded by a ring of great fertility, which, however, gradually becomes sterile as the salt patch grows in extent and the ring of fertility widens.

The Origin of Sodium Carbonate.

Sodium carbonate, or black alkali, is generally the product of reactions in the soil. After the soil is leached continually with sodium chloride (common salt) and then with pure water, sodium carbonate is recovered. At one time it was thought that this was due to the simple reaction between the sodium chloride and the calcium carbonate (limestone) in the soil. According to modern views, however, the reaction is more complicated. When a soil is impregnated with sodium chloride, complex insoluble sodium silicates are formed, together with soluble calcium chloride, which may be leached out. If the soil is now washed with pure water, sodium hydroxide (caustic soda) is formed, which reacts with the carbon dioxide of the soil, giving sodium carbonate, or black alkali. If this is removed from the soil by leaching, fresh sodium carbonate is produced from the store of sodium silicates present, which accounts for the great difficulty experienced in endeavouring to completely remove the black alkali from the soil.

Preventive Measures and Reclamation.

1. *Prevention is Better than Cure.*—It is far easier to prevent salt accumulating than to remove it when it once appears. In some cases it is impossible to reclaim salt-impregnated soils. Early in the century the United States Department of Agriculture carried out experiments in reclaiming salt land. Salt lands in three localities were selected for the experiments, the first being at Billings, Montana, where the salt present was mainly sodium sulphate;

the second near Salt Lake City, Utah, where, as before mentioned, the salt is mainly sodium chloride; and the third at Kearney Park, Fresno, California, where sodium carbonate was present. In the Utah tract the salt was several inches thick on the surface, and this was therefore a good test. Tile drains were laid in these three localities, the depth, spacing, and size of the drains being carefully designed by engineers. The soils were flooded several times by irrigation water in an endeavour to wash the salt out of the soil through the drains. In the first two cases the land was completely reclaimed. It was thought at the time that this was also the case with the soil at Kearney Park and a crop of barley was successfully grown, but after two years the land was as bad as ever, and improvement has never yet been effected.

Kearney Park Ranch, consisting of several thousand acres, planted up to deciduous trees and vines, belongs to the University of California, and is worked by them as a commercial proposition. The water table was originally about 90 feet below the surface; after the continual application of irrigation water, however, it rose to the surface and salt accumulation resulted. Sodium carbonate (black alkali) was formed in the way described above, which accounted for the difficulty of reclamation. The tiles were at first placed 6 feet deep, and as it was thought that an improvement would result if they were placed lower, they were lowered to a depth of 12 feet, but without effective results. Altogether about a thousand acres are affected, and since 1904 much investigation has been carried out in an endeavour to reclaim this plot of land. In fact, more scientific investigation for this purpose has been carried out on this land than on any other in the world, but a solution to the problem has not yet been discovered, although recent work is encouraging.

Fortunately there is very little black alkali on the irrigation settlements in Australia; nevertheless, from the above considerations, care should be taken in preventing the accumulation of salts. In certain cases it may be impossible to reclaim land once it becomes salt impregnated. Not only this, but it is found that in many cases where salt land is reclaimed the fertility of the soil is greatly reduced, due partly to the leaching out of plant food and partly to the poor physical condition of the soil produced.

2. *Correcting Poor Irrigation Water.*—If the quality of the irrigation water is at fault the remedy is to obtain, if possible, a purer supply. This may be done in some cases by the construction of dams or locks, as on the River Murray.

3. *High Water Table.*—If a high water table is the cause of the accumulation of salt, this should be remedied by tile draining if necessary.

4. *Reducing Surface Evaporation.*—By giving light irrigations in deep furrows in order to make the water percolate into the soil without wetting the surface more than necessary and by paying particular attention to cultivation to maintain a good surface mulch, the evaporation from the surface may be reduced and the rise of salt prevented.

5. *Washing Salt out of Soil.*—In order to remove salt already present in the soil an exactly opposite procedure should be adopted. The land should be flooded by heavy irrigations, wetting the whole of the surface in order to leach the salt out of the soil. In this case it is necessary to make provision for good under-drainage, and the construction of tile drains is almost always necessary. Tile drains will also prevent a high water table, and, if the irrigation water is slightly saline, it will be possible to give fairly heavy irrigations, allowing the excess water to drain away through the tiles, thus preventing the salt accumulating. It is thus seen that tile draining is not only the best preventive, but is the most effective method of removing salt.

6. *Use of Gypsum and other Correctives.*—If the soil is heavy it may be necessary to apply gypsum in order to facilitate the downward percolation of the water. Gypsum is especially beneficial if sodium carbonate (black alkali) is present, as it tends to convert the latter into sodium sulphate and to replace sodium in the sodium silicates by calcium. However, owing to the mode of the formation of the sodium carbonate, as described above, it is necessary to add far more gypsum than was previously supposed. Sulphur and other substances have also been used to assist in the reclamation of black alkali soils. Heavy dressings of farmyard manure and other organic manures are beneficial in various ways. They help to build up the fertility of the soil and, as explained, the organic matter decreases the toxicity of the salt.

7. *Temporary Methods.*—It is sometimes possible to remove the salts from the surface to the lower layers of the soil by heavy irrigations or by deep ploughing for sufficiently long periods to germinate or even to grow annual crops. This is important in the cultivation of lucerne, which, although being very susceptible to alkali injury in the seedling stage, is very tolerant when mature.

8. *Use of Salt-resistant Crop*:—If a soil is too saline for one crop it may still be possible to grow one of greater resistance. Beets, which are an important irrigation crop in America, are very tolerant of salt and are used extensively on salt land, and greater attention should be given to the growth of mangels on salt soils in Australia for the same purpose. Land which is too salt for citrus will often support vines. In Egypt rice is continually grown on very salt soil. In this case the flooding of the land washes down part of the salt from the surface soil, and dilutes the rest to such an extent as to permit the growth of the crop.

Lucerne often proves invaluable as a crop for salt lands. When once established it is very tolerant, and it not only improves the soil by the addition of organic matter and by its well-known effect of opening up the soil, but it tends to prevent the accumulation of salt in specific layers of the soil by minimising evaporation from the surface. This is accomplished in two ways. In the first place the dense growth very effectively shades the soil and creates a humid atmosphere near the surface, and secondly, the water

is abundantly absorbed by the deeply penetrating roots, to be transpired by the leaves, which checks a continual capillary current to the surface. *Melilotus indica* and Bokhara clover (*Melilotus alba*), particularly the latter, are also useful in this respect.

9. *Other Preventive Measures.*—Removing the salt from the surface by mechanical means, such as scraping, has sometimes been advocated, but is seldom of any practical value. An endeavour is also sometimes made to remove the salt by surface flushing with water. This is quite useless. Only a small part of the salt in the soil is actually on the surface, and of this much dissolves and soaks into the soil, where it cannot be removed by water flowing over it. The only way to remove salt from the soil by water is to make the water soak through the soil and to drain it away by underground drains.

Conclusion.

In conclusion, the distinctions between seepage, a high water table and salt should be noted. These terms are often used synonymously. Where seepage or a high water table occurs salt usually appears, and again a high water table may result locally from continual seepage from ditches. It is possible, however, to have a high water table without seepage, and salt without either seepage or a high water table. Where a high water table is present it is sometimes difficult to say whether this or the resultant salt is the chief cause of injury to crops growing on the soil, but the remedy is the same in either case.

When Marketing Tomatoes.

Care should be taken when gathering tomatoes that the fruit be not bruised, or it will decay rapidly. Tomatoes that are to travel long distances, or occupy days in transit, should be picked when they begin to colour at the blossom end, or even when they take on a light-green colour.

When packing, the fruit should be graded according to size and ripeness, all in each package being as nearly alike as possible. The grading should be as follows:—

1. Large ripe fruit.
2. Small ripe fruit.
3. Large medium ripe.
4. Small medium ripe.
5. Large green fruit.
6. Small green fruit.

The fruit will thus look better, sell better, keep better, and pack and travel better, and the arrangement will be found advantageous to the buyer and more profitable to the seller, besides establishing a reputation for the brand among buyers. Each package must have the contents and quality faithfully marked on the outside, so that buyers may learn to rely on the brands without wanting to overhaul the fruit.

Culls should not be marketed, but fed to pigs or destroyed, as is done with other refuse fruit.

Kyogle Seed Maize Contest.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

During the past season the Kyogle Pastoral, Agricultural, and Horticultural Society organised a seed maize yield contest, wherein local maize growers entered a sample of their own seed maize, portion of which was planted on two farms within the district under equal conditions as to cultivation, soil, and situation. The Department co-operated by assisting with the planting and harvesting of the plots.

Contests of this kind have as their object the determination of the best yielding varieties and strains of maize grown in a given district. They aim also at the ultimate elimination of undesirable types. They have already proved a success in many of the leading maize-growing districts of the State, and the response to the initial effort at Kyogle is most encouraging. The competition was sown in duplicate in order to minimise risk of failure to secure comprehensive results on the difficult types of soil in the district, the soil on Miss Mitchell's farm being typical of the volcanic soils, and that on Mr. Ramsay's of the alluvial flats.

A field demonstration day was arranged on 21st April, when an inspection of the plots was made. At harvesting also (on 7th and 9th June) a number of keenly interested farmers were present.

The rainfall during the growing period was as follows:—December, 218 points; January, 654; February, 97; March, 240; April, 441; May, 326; June, 128; total, 2,104 points.

Result of the Contest.

Competitor.	Variety.	Kyogle.		Horseshoe Creek.		Average.	
		bus.	lb.	bus.	lb.	bus.	lb.
R. J. Moore...	Fitzroy	70	33	58	7	64	20
J. J. Heffernan	Fitzroy	51	35	49	16	50	26
Miss Mitchell	Fitzroy	58	46	38	14	48	30
Dept. of Agriculture (non-competitive)	Fitzroy	43	44	43	23	43	34
O. C. Green...	Fitzroy	49	38	36	3	42	49
Dept. of Agriculture (non-competitive)	Ulmarra Whitecap ...	45	5	39	0	42	3
W. McNaughton	Fitzroy	43	44	35	18	39	31
Dept. of Agriculture (non-competitive)	Whitecap Horsetooth ...	39	49	36	44	38	19
C. Hogan	Fitzroy	52	53	22	25	37	39
Dept. of Agriculture (non-competitive)	Yellow Hogan	......		33	47	......	
J. W. Ramsay	Hawkesbury Yellow ...	31	21	24	16	24	47

Quite apart from the stimulation of the competitive instinct, the direct result of a contest of this kind is ultimately to identify not only the highest yielding variety for a given locality, but also to indicate the most desirable strain of that variety, and the concentration of growers on that particular strain must be conducive to maximum production in so far as the seed factor operates, and to the development of greater uniformity of product. To attain the maximum effect, however, and to avoid the danger of premature conclusions, these contests must be continued over a number of seasons.

The Honey Flora of N.S.W.

Arrangements are being made for the collection of information with regard to honey-producing flora in the various districts throughout the State. There is a distinct dearth of information regarding our honey flora, and the importance of collecting the fullest possible data for the guidance of bee-keepers and others who may be contemplating a start in the industry does not need to be emphasised.

The earnest co-operation of all established apiarists is sought.

A supply of forms had been printed, and is being distributed in the first instance to members of the New South Wales Apiarists' Association. Departmental officers engaged in apiary inspection work will also distribute forms on their travels through the country. Each apiarist is asked to keep a complete twelve months' record of the honey flora in his district, and then to forward the information to the Department under the following headings:—Honey flora, trees, plants, or shrubs; date of bud development; date flowering commenced; date flowering ended; estimate honey produced (pounds per colony); colour of honey—light, medium, or dark.

A Fitzroy Seed Maize Contest.

In order to encourage those farmers who are growing Fitzroy maize, the Department has arranged to conduct a contest among producers of different strains. Seed will be sown on a selected area at Grafton Experiment Farm, and the Department's certificate awarded to the farmer whose sample gives the highest yield.

Farmers who have devoted attention to seed selection and who, therefore, have good strains of the variety named, are invited to forward 5 lb. of seed to the Manager, Government Experiment Farm, Grafton. It will be necessary to limit the number of competitors to about twenty-five, and the Department also reserves the right of refusing any entry not sufficiently pure or true to type, so that the purity of seed at the Farm will not be endangered. Somewhat similar tests have been conducted in the past on the North Coast, and have proved of considerable value in improving the yielding qualities of maize, and have also been of benefit to farmers by reason of the demand which has been created for seed.

Inquiries should be addressed to the Farm Manager, or to the Under Secretary, Department of Agriculture, Sydney.

A Flood Proof Fence.

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

DURING the winter of 1925 a very disastrous flood occurred in the Murrumbidgee River. Great damage was done to fences all along the river flats. In the vicinity of Gundagai and Wagga Wagga many thousands of pounds worth of wire netting fences were totally destroyed by the flood waters. The posts were pulled out and the netting strained and twisted until it was drawn out like rope. All the netting fences on the flats had to be re-erected with new wire and in many cases none of the old material could be used at all.

The Normal Position of Flood Proof Fence.

The fence proper is standing against the post, to which it is lightly attached.

The most disquieting feature is that exactly the same thing is likely to happen again almost any year, and with this in mind landowners on the flats have been seeking for a flood proof fence. Many different fences have been tried at various times and found wanting. The great depth of water, the swiftness of the current, and the amount of debris brought down by the river when in flood make the problem of a satisfactory fence very difficult.

Mr. B. Wilson, of Warilya, near Gundagai, has just had half a mile of collapsible fence erected on his property. This type of fence has given satisfaction elsewhere in New South Wales, and although it has not yet had the

opportunity of demonstrating its effectiveness on the Murrumbidgee flats, it is anticipated that it will be quite satisfactory.

The details of the fence are as follows:—The posts are 33 feet apart (centre to centre). Two wooden droppers are placed between the posts and another right alongside each post, so that the droppers are bored with one hole 4 inches from the ground and 1½ inches from the edge on the lower side of the post (*i.e.*, the down-river side of the post). Another hole is bored 3 inches from the top of the post and 3 inches from the edge. The posts are 6 feet long, 2 feet 6 inches in the ground, and 3 feet 6 inches above ground. The droppers are bored 4 inches from the bottom and then at the

How the Fence falls over during a Flood.

following distances:—6 inches, 6 inches, 7 inches, 8 inches, and 11 inches, allowing the top barbed wire to rest on the side of the dropper to which it is tied through the hole with tie wire. The droppers are 3 feet 10 inches long, and 3 inches by 2 inches or 4 inches by 1½ inches. The droppers have the lower wire reeved through them and then through the post. Each dropper

near a post has a piece of galvanised wire passed through the top of the post, then round the dropper and tied so that it will give way in flood time, allowing the fence of droppers to collapse. The bottom wire (4 inches from the ground) holds the fence to the posts. After the flood has subsided all that is necessary is to stand the fence of droppers upright again and attach it to the posts as before. All the droppers are tightly keyed to the top barbed wire, which is of No. 12 gauge. The black wire used is No. 8 gauge. Strainers are placed every 12 chains and also at every bend or corner of the fence. At the strainers or corners the droppers are securely wired to the posts. If the droppers are only loosely secured to all the other posts when the pressure of flood waters comes against the fence it will fall down-stream and the water and debris will pass over it without tearing it away. To make quite certain of the fence it would be of great advantage to ride along before the flood arrived and undo the wire holding the droppers to the posts. As these wires are only held around the droppers by one hand twitch of the wire they are quickly undone. If the directions given above are followed, however, there will be no need to undo the fence, as it will release itself very easily.

It is thought that the introduction of this fence to the Gundagai district will be the means of saving many thousands of pounds to farmers in the future. It is not, of course, suggested that farmers should rebuild any of their present fences, but it is recommended that any new fences erected be built on this principle, also that should the present fences be again destroyed by flood that the new type of fence be erected instead of the ordinary one.

This fence actually cost £67 19s. a mile, including cost of materials and erection. Mr. Wilson paid at the rate of 10s. a chain to erect it, as it was the first of its kind put up in this district and was therefore somewhat expensive, but it is expected that such a fence could now be erected at 7s. a chain. This would reduce the cost of the fence to £55 19s. per mile

WATER CONSERVATION IN VICTORIA.

VICTORIA has expended in round figures £16,000,000 on the storage, control and regulation of water. This is independent of the Melbourne water supply, where something like £7,000,000 additional has been laid out. Half of the £16,000,000 spent has been for irrigation, and approximately half has been laid out in providing works for domestic and stock supplies. As a result of this expenditure, it is estimated that at least one-fourth of the area of Victoria is now artificially supplied with water for domestic and stock use, while something like 1,500,000 acres are commanded by channels for irrigation. In addition to the area quoted there are, of course, many portions of the State which are well provided with water from streams and lakes and natural rainfall, but the area quoted is that where water has been conveyed and where previously no supply existed.—W. CATTANACH, Chairman, State Rivers and Water Supply Commission, Victoria, at the Agricultural Bureau State Conference.

Farmers' Experiment Plots.

SWEET SORGHUM TRIALS, 1925–26.

The Upper North Coast.

M. J E. SQUIRE, H.D.A., Agricultural Instructor.

THE following farmers co-operated with the Department in conducting sweet sorghum trials during the past season:—

G. E. Neale, "Fairfield," Bangalow.
M. McAuliffe, Tregeagle, via Lismore.
M. McMillan, Yorklea, via Casino.
T. Hannah, junior, Lower Southgate, Clarence River.
M. D. O'Connell, "Riverbyn," Coramba.
M. McBaron, "Riverview," Raleigh.
G. Johnson, Whisky Creek, Dorrigo.

Owing to adverse weather conditions during the growing period, results were only obtainable at Tregeagle, Lower Southgate, Coramba, and Raleigh. Observations were, however, made at the other centres, and on appearances Honey and White African made best growth at Bangalow, while at Casino White African, Honey and Gooseneck were the outstanding varieties. At Dorrigo consideration has to be given to a variety which will withstand a considerable amount of cold weather and remain green and succulent during late autumn, as well as yield heavily. Collier and Sorghum No. 61 appear to be the most suitable varieties.

Rainfall during the growing period:—

	Tregeagle.	Lower Southgate.	Coramba.	Raleigh.
	Points.	Points.	Points.	Points.
Nov., 1925 ...	......	......	......	782
Dec., ,, ...	457	......	......	602
Jan., 1926 ...	303	39	......	543
Feb. ,, ...	141	......	113	106
Mar., ,, ...	576	618	596	1,005
April, ,, ...	571	370	501	605
May ,, ...	......	100	313	......
June, ,, ...	......	......	300	......
Total ...	2,048	1,318	1,823	3,643

Cultural Details.

Tregeagle.—Red volcanic loam; previous crop oats for green fodder. Land ploughed and harrowed in October and reploughed and harrowed just prior to planting. Planted 2nd December in drills 3 feet apart; harvested 17th April.

Lower Southgate.—Alluvial loam; previous crop potatoes. Land harrowed after harvesting potatoes and ploughed, harrowed and rolled just prior to planting. Planted, 11th January; harvested, 5th June.

Coramba.—Yellowish clay loam; previous crop oats for fodder. Land ploughed after cutting oats and reploughed and harrowed just prior to planting. Planted, 16th February; harvested, 29th June.

Raleigh.—Alluvial loam; previous crop oats and legumes. Land ploughed and harrowed in September, and disc harrowed and harrowed just prior to planting. Planted, 17th November; harvested, 13th May.

RESULTS of Variety Trials.

Variety.	Tregeagle.			Lower Southgate.			Coramba.			Raleigh.		
	t.	c.	qr.	t.	c.	qr.	t.	c.	qr.	t.	c.	qr.
White African	15	4	1	12	3	2	10	16	0	27	17	0
Honey	12	11	2	17	3	3	12	19	1	12	8	2
Collier	9	16	2	13	4	1	28	1	3	12	19	1
Saccaline	8	3	0	13	1	1	28	1	3	12	19	1
Gooseneck	14	14	3	10	16	0	12	19	1	16	4	0
Sorghum 61	11	6	0	10	8	1	22	5	0	11	17	3
Sumac	12	5	2	8	11	0	21	12	1	10	16	0
Red Amber	12	5	2	7	13	1	12	19	1	18	6	1

RESULTS of Fertiliser Trials.

Fertiliser per acre.	Tregeagle. (Collier).			Lower Southgate. (Collier).			Coramba. (Collier).			Raleigh. (Honey).		
	t.	c.	qr.	t.	c.	qr.	t.	c.	qr.	t.	c.	qr.
Superphosphate, 140 lb.	14	10	3	13	15	0	29	10	2	28	12	2
*M13, 182 lb.	13	7	1	12	15	1	...	...	...	21	15	0
*M5, 210 lb.	18	11	2	11	4	0	...	...	...	12	12	2
No manure	9	16	2	13	4	1	28	1	3	12	8	2

* M5 mixture consists of 2 parts superphosphate and 1 part sulphate of ammonia. M13 of 10 parts superphosphate and 3 parts sulphate of potash.

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

SORGHUM sown for feeding as a green fodder during the winter months is again popular with dairy farmers on the South Coast, particularly in the Illawarra and Camden districts. Varieties which are late maturing and hold their succulence well are sought by the farmers, the sweet sorghums being, of course, most suitable.

Two experiment plots were sown last season—one at Camden and the other at Tanja, near Bega. Seed was also sent to other districts, but was not sown on account of unfavourable weather conditions.

The usual practice is to sow in December or January. Under ordinary conditions the later maturing varieties sown at this time, providing hard frosts and westerly winds have not been too frequent, are of some use during

July, when the pastures are deficient, but such feed is not, after all, of as much value as good maize silage, and is not nearly so economical. However, in situations which are not subject to much frost, good results may be obtained.

The seed on the Camden plots was drilled by means of the maize planter, using a sorghum plate, at the rate of between 4 and 5 lb. per acre, the size of the seed being responsible for the variation in the amount, and also, naturally, for a variation in the yield of fodder. The stands of White African and Sorghum No. 61 were adversely affected, being sown more thinly owing to the seed being larger than that of other varieties.

The drills were 2 feet 9 inches apart. Superphosphate at the rate of 2 cwt. per acre was applied at the time of sowing.

The soil in both cases is derived from basalt formation.

The supply of soil moisture was sufficient for germination, but weather conditions after sowing were extremely bad. The rainfall registration at Camden from December, 1925, to the end of February, 1926, totalled only 81 points. The plants struggled on until the rain came in the middle of March. Although they exhibited by this time a very dry and wilted condition, they responded when good falls came and made remarkable growth, and, experiencing a comparatively mild winter, retained their succulence up to a later period than usual. The outstanding variety was White African, which has been under test now for three seasons in the South Coast experiments, and maintain its reputation as a most suitable variety. Strong growing, leafy, and sweet, and retaining its succulence late in the season, it will, no doubt, be largely grown when seed supplies are more plentiful. It is intended to establish further seed plots this season. As this is a very late maturing variety, it is advisable that sowings for seed be made not later than November.

Sugar Amber, a variety favoured in some parts of Victoria, was under test, but does not appear to be suitable as compared with other well-tried varieties, its season being too short and its yield too low. All the other varieties under test may be regarded as quite suitable for the dairy farmer's requirements.

The yields were as follows:—

Variety.	T. Kelly, Tanja.				J. W. Childs, Camden.			
Sown ...	29th Nov., 1925				28th Nov., 1925.			
Harvested ...	3rd August, 1926				27th May, 1926.			
Rainfall ...	1,098 points.				2,019 points.			
	t.	c.	qr.	lb.	t.	c.	qr.	lb.
Collier ...	21	6	0	0	12	19	3	20
Gooseneck ...	19	0	0	0	9	1	1	0
Honey... ...	21	8	2	26	13	9	1	4
White African ...	35	6	1	4	13	6	3	4
Saccaline ...	24	0	0	0	15	1	2	2
Sorghum No. 61 ...	25	6	3	0	9	13	1	6
Sugar Amber... ...	....				9	2	3	22

The Peanut.

[Continued from page 768.]

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor,
and G. NICHOLSON, H.D.A., Experimentalist, Grafton Experiment Farm.

Uses and By-products.

UNTIL recent years peanuts were used in Australia almost entirely in the roasted form in the shell, but within the last few years, as in America, they have come to be used as a confection in several ways—salted, sugar or caramel coated, in toffees, nut chocolates, and in cakes by confectioners and bakers. When used in these forms, the peanuts are generally "blanched." Blanching consists of removing the red skin and the germ. This is accomplished by rubbing the roasted and shelled peanuts by hand over a wire-bottomed screen or sieve. The skin is removed easily by this rubbing and the kernels are separated into halves, the germ falling through the screen. The skins are then easily removed by winnowing.

Roasting.—To roast peanuts in the shell, a hot oven maintaining a temperature of 400 to 450 deg. Fah. for about thirty minutes is required. The only way to tell whether the roasting is being properly done is to sample the nuts from time to time. It is easy to over-roast them in a hot oven, and some local growers in preparing their own roasted peanuts for market have adopted a revolving cylinder heated by a flame which gives very uniform results.

In roasting shelled peanuts the temperature should not exceed 320 deg. Fah.

Peanut Butter.—Peanut butter is an article of commercial importance in America and is beginning also to become known in Australia. This product is unfortunately badly named, as it is a highly albuminous article of diet which should be used with dairy butter rather than in place of it. It is becoming popular for sandwiches for city business people, and is also used in soups, gravies and with macaroni.

In the process of manufacture, the shelled and blanched roasted kernels are ground to a fine granular form rather than to a pasty consistency by a special grinder similar to that used for mincing meat and about 1 to 3 per cent. of salt added during the grinding. The germs are usually removed because the butter containing them is likely to become rancid more quickly.

Spanish peanuts are said to give smoothness to the product, while Virginia nuts give flavour, and a blend of these two varieties makes a better product than either variety alone.

Peanut butter is a wholesome and highly nutritious food. It is estimated that the American consumption is about 40,000 tons annually. It contains one and a half times as much protein, three times as much fat and three times as much fuel value as steak.

Peanut Flour.—Peanut flour is being manufactured and used with wheaten flour in America to make more nutritive bread, biscuits, cakes, &c., and this manufacture is projected in Australia also. The flour or meal is obtained either directly from roasted or raw peanuts or from peanut oil-cake. The flour obtained by grinding the wasted or unroasted kernels has the same composition as the kernel, but when it is made from peanut oil-cake, after most of the oil has been removed from the peanut, the flour contains a very high percentage of protein.

Flour from—	Water.	Ash.	Fat	Protein.	Fibre.	Carbohydrates.
Peanut cake ..	8	4·8	8	48	4·7	26.5
Shelled nuts ..	4	2·7	47	28	2·5	13·8
Wheat	12	0·5	1	11	0·2	75·3

Peanut Oil.—America now manufactures for herself very large quantities of peanut oil, which is valued highly for culinary purposes, as an edible oil and also for the manufacture of margarine, soap, &c., and Australia has at least one firm which can make use of low quality nuts unsuitable for confectionery, for the extraction of this commodity.

White Spanish is the variety most in favour for the manufacture of peanut oil, since it contains a high oil content and the largest percentage of meats or kernels. A good sample of this variety contains 45 per cent. oil, and at this rate 1 bushel of nuts will yield 1 gallon of oil. One ton of nuts will yield from 70 to 80 gallons of oil, the amount obtained being determined by the variety and condition of nuts used. Peanut oil is recognised as one of the world's most important food oils. High-grade oil produced from the first pressing of selected nuts can be used as a substitute for olive oil, is a component part of salad oil, and can be taken with perfect safety internally. Its value ranks about midway between cotton-seed oil and olive oil, being of a slightly lower value than high-grade olive oil. High-grade oils are only produced when the nuts have been shelled, blanched (the thin skin or testa removed), de-germed, and cleaned before pressing.

Although the composition of the germ varies but slightly from the meats, it is the usual practice to remove it when manufacturing a first-class product, since it is bitter and contains a fat which rapidly breaks down and becomes rancid. Oil obtained from unshelled nuts is of a lower grade, is unfit for table use, and is generally used in the manufacture of margarine, soap, leather dressings, furniture creams, &c. Damaged, rancid and low-grade nuts are also used for this purpose. Refined second-grade oils enter largely into the manufacture of peanut butter and margarine. Peanut oil cannot be used in the manufacture of paint on account of its drying qualities, and as a lubricant is unsatisfactory since it contains a free fatty acid which causes stickiness.

Peanut meal is the chief by-product of manufacture. This is a highly concentrated stock feed, and when it becomes known, will be recognised here, as in America, as highly valuable for pigs, dairy cattle and for poultry. Only a small addition to the ration is necessary to produce results, the meal ranking higher than most other concentrated feeds on the market in Australia.

Peanut hay is used extensively on the farm in America, and also enters largely into commerce as a hay which is little, if any, inferior to lucerne hay.

One acre of peanuts will yield from 10 to 20 cwt. of hay. Prime peanut hay, made from the plants before the leaves fall, is slightly inferior to lucerne hay, both in feeding value and quality. It is a palatable fodder, relished by horses and cattle. When properly cured and stacked it is a good standby for the winter months or during periods of dry weather. A disadvantage associated with peanut hay is the presence of a certain amount of sand and dirt. If such foreign matter is present to any great extent, it is advisable to feed from a feeding trough with a wire-netting bottom so as to allow the sand and dirt to sift through.

COMPOSITION of Peanuts and By-products.*

Product.	Moisture.	Ash.	Ether extract.	Protein.	Fibre.	Nitrogen free extract.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Peanut meats (kernels) ...	4·8	2·4	47·2	29·8	2·8	12·9
Peanut germs...	5·6	3·1	45·4	29·1	4·5	12·0
Peanut shells from crushing mills.	7·9	3·0	2·9	6·8	62·3	17·1
Pure peanut meal from shelled peanuts.	7·2	4·3	8·4	51·7	4 7	23·8
Crushed whole peanuts, expeller process.	6·2	4·0	7·3	36·6	24·3	21·5
High-grade cake, hulls removed by suction.	7·3	5·6	8·5	46·9	9·5	22·4
Lower grade cake containing percentage of hulls.	8·3	2·7	8·8	43·4	12·1	24·7

Proportion of meats to hulls (Spanish type), average 24·5 per cent hulls, 75·5 per cent. meats.
Proportion of pops to normal peanuts varied from 1 to 10 per cent.

* Compiled from Bull. 1096, U.S. Dept. Agri.

Crushing whole peanuts by the expeller process usually gives a meal containing from 34·4 to 38·6 per cent. protein. Crushing peanuts from which the hulls have been removed by the hydraulic process gives a meal containing 45 to 49 per cent. of protein. Peanut hulls are of low-feeding value, containing a large percentage of fibre and are only suitable when finely ground and fed with concentrates. Shells ground into a very fine powder are used by tin-plate makers for polishing.

"Hogging-off" Peanuts.

In some districts of America it is a common practice to plant peanuts for feeding off to pigs. With the adoption of this practice the danger of losing the crop through wet weather disappears, and the cost of harvesting is dispensed with. A serioius drawback to fattening pigs exclusively on peanuts is that they produce a greasy, soft pork, but this disadvantage can easily be overcome by topping off with maize.

Feeding-off experiments carried out at the Alabama Agricultural Experiment Station (Bulletin No. 206) produced the following results:—

1. An acre of peanuts in one test yielded 39·5 bushels (about 900 lb.) and returned a net profit of £7 5s. in favour of grazing the area with pigs over selling the crop on the market, when pork was 7½d. per lb., peanuts 3d. per lb. and peanut hay £3 per ton.
2. A similar test carried out during the following year returned a net profit of £2 15s. over and above what the crop would have netted if sold on the market.
3. When pigs grazed the entire crop of peanuts yielding 39·5 bushels to the acre, the acre produced 668·2 lb. of pork. The 30·5 bushels crop produced 416 lb. pork.
4. It required an average of 1·84 lb. of peanuts, plus the forage and other vegetation, to produce 1 lb. of pork.
5. An acre of peanuts yielding 39·5 bushels furnished grazing for seven pigs weighing 63·5 lb. (average weight at beginning of test) for fifty-seven days.

Under existing conditions in Australia it is very doubtful if planting peanuts on good maize land for the express purpose of feeding off would pay, when the ruling market price for peanuts and pork are about equal. Circumstances (such as a shortage of labour, an unfavourable market price, or a wet harvesting period) may arise which would make feeding off preferable to marketing the crop. Even when the most careful harvesting methods are practised a number of the nuts always remain in the soil, while others are left on the surface, due to shattering when handling the vines. These can be put to profitable use by turning the pigs into the paddock to clean up the residues. Whenever practicable, this system is worth adopting, for not only are the crop residues turned to profitable account, but the cropping capacity of the soil is also improved, both mechanically and chemically.

General Prospects and Market Requirements.

When a few years ago peanuts were used almost solely in the roasted form they were mostly imported from China, and about 1,500 tons were consumed in Australia annually. The consumption is still about this figure, but it is now about equally divided between peanuts for roasting and peanuts for the confectionery purposes previously mentioned. It is expected that when peanut butter, peanut flour and the other manufactured products or confections become better known, the demand for peanuts will increase greatly.

In America it is estimated that the demand for peanuts and their products for human consumption is about 10 lb. per annum per head of the population, and if Australia used peanuts in this proportion there would be an annual consumption of 25,000 tons instead of the present figure.

A large area of peanuts (probably about equal to that grown for human consumption) is grown in addition to this for "hogging down" in America, and it is expected that this practice will increase in Australia when peanuts come to be more largely grown on some of the poorer soils, which are better adapted to peanuts than to most other crops. As pointed out earlier, by supplementing the diet with maize and other feeds, the farmer can avoid the very soft grade of meat that would otherwise result.

In recent years the duty on peanuts has been increased to 4d. per lb. for peanuts in the shell and 6d. per lb. for kernels, and importers and manufacturers are beginning to look to local production to supply their requirements. The imported article if usually of high quality, it being possible to subject it to grading by cheap labour in the countries from which it is imported. Local producers cannot therefore expect a price equivalent to the landed cost of imported nuts, unless their produce is of the same quality. However, the price which is being offered at present has proved satisfactory to some growers, and farmers can best determine by growing an acre or so of peanuts whether the crop is more profitable to them than their usual crops.

A Sydney firm is offering the following prices for the 1926 crop of white Spanish nuts according to grade:—

Grade 1.—F.a.q. containing	70 per cent. or more of sound	No. 1 kernels,	4½d.	per lb.
Grade 2 — ,, ,,	65 to 70 per cent.	,, ,,	4d.	,,
Grade 3.— ,, ,,	not less than 60 per cent.	,, ,,	3¾d.	,,

These prices are ex rail Darling Harbour. No. 1 kernels must be dry, mature, free from vermin, mould, sticks, stones and other extraneous matter.

The above definite offer marks the beginning of the possible establishment of a large peanut-growing industry in Australia, and there is no reason why, when the high value of peanuts as a food in the different forms becomes more fully known and appreciated, the industry should not become as relatively important here as it is in America.

Infectious Diseases Reported in September.

The following outbreaks of the more important infectious diseases were reported during the month of September, 1926:—

Anthrax	1
Pleuro-pneumonia contagiosa	21
Piroplasmosis (tick fever)	Nil.
Swine fever	Nil.
Blackleg	5

—Max Henry, Chief Veterinary Surgeon.

Stocks for Plums and Prunes.

EXPERIMENTS AT YANCO EXPERIMENT FARM.

W. W. COOKE, Senior Orchardist.

THIS experiment was commenced in 1917, when a plot not quite 5 acres in area was planted out with four or five different stocks, viz., Myrobalan, Marianna, apricot, and peach in rows in the above order. Later these rows were worked across with Angelina Burdett, Grand Duke, Blue Imperatice, and President plums, and Robe de Sergeant, Prune d'Agen and Standard prunes. Progress reports on the growth made by each variety on the different stocks have appeared from time to time in the *Gazette*. It is not yet possible to give a final report, as their behaviour in the next few years may cause a modification of the opinions already formed.

It was soon noticed that there were considerable differences in the amount of growth made. Angelina Burdett, Grand Duke, and President plums made strong growth on both peach and apricot stocks, medium growth on Myrobalan and weak growth on Marianna.

Both Robe and d'Agen prunes made the best growth on peach and apricot, but there was not that difference that was so noticeable with the two plums Angelina and President or with Grand Duke and Blue Imperatice. Though Standard prune made slightly better growth on peach and apricot stocks than on Marianna or Myrobalan, the growth made has been very poor on all four stocks. This is to be regretted, as the quality of the dried Standard is very good.

With regard to the cropping habits, in every case those on Marianna cropped first, followed by Myrobalan, peach and apricot. This early cropping of those on Marianna stock was a decided disadvantage in some cases, especially with President plums, as, in spite of heavy spur-pruning, too much fruit was produced, to the detriment of the health of the tree. Although the plums and prunes on apricot and peach were longer in coming into bearing, they were not unduly late in this respect, and at seven years old were carrying as much fruit as, or more than, those on Marianna, the greater size of the trees making up for the heavy cropping habits of those on the Marianna stocks. The above remarks refer mostly to Angelina Burdett and President plums, and only in a lesser degree to Robe de Sergeant and Prune d'Agen. During the last two or three years these latter varieties have made better growth on Marianna stock, and now more closely approach in size those on the three other stocks.

It was shown very plainly this season that Prune d'Agen on apricot and peach stocks will not tolerate any shortage of moisture. During February of this year the irrigation of part of this block was delayed a fortnight through a failure in the supply of water in the main channel. Half the block had been watered when this occurred, preventing any

further watering for a fortnight. Therefore half the d'Agen on the four stocks were irrigated at the correct time and the other half two weeks later. This half became much drier than the ground is normally allowed to get on this farm, the weather being hot with strong winds during the two weeks mentioned. No difference could be noticed in the leaves or fruit of the d'Agen or Myrobalan and Marianna stocks that were not watered at the correct time when compared with those that were. With the d'Agen on apricot and peach stocks, however, the difference was very noticeable even from a considerable distance, the leaves having turned yellow. The fruit also shrivelled and was of no value, and the trees had all the symptoms of suffering from a drought. The system of planting made this the more noticeable, as two trees with droughty appearance (yellow leaves) alternated with two healthy ones over half the block.

The only definite conclusions that can be drawn so far are that Marianna stock is not suitable for Angelina Burdett or President plums, and that Standard prune is not successful in this class of soil—fairly stiff loam overlaying clay—on any of the four stocks tested.

Accountancy in Dairying.

No business can be successfully carried on without book-keeping—the more departments there are the more urgent is the need for a complete system of accountancy; otherwise effort is wasted, profits disappear, and no progress is made. Any department in business that is not a profitable one is soon eliminated, and the same thing should apply to a dairy herd. The average dairy-farmer has forty or fifty departments in his herd alone, and he cannot distinguish between the profitable and unprofitable ones without the use of the Babcock tester.—A. C. Small, Senior Dairy Instructor.

The Progress of Bee-keeping in New Zealand.

In 1906 there were 15,396 bee-keepers in New Zealand, who, in that year, produced 1,013,940 lb. of honey and 31,652 lb. of wax. About this time the Apiaries Act, which is claimed to be the best of its kind in any part of the world, for protecting the interests of commercial bee-keeping, was brought into force. Two inspectors were subsequently appointed, and it was here that the Department's operations were really initiated under the directorship of the Horticultural Branch of the Department of Agriculture. Progress during subsequent years was very marked, as the result of the Department's policy of gradually eliminating careless bee-keepers whose chief interests were not vested in bee-keeping, together with the succouring of the industry by providing instruction along sound lines, and the wise administration of the Apiaries Act. The position in 1923 was altered to approximately 7,000 bee-keepers, who produced 3,000,000 lb. of honey, and last year production increased to 4,480,000 lb.—H. Graham Smith, Apiarist, Hawkesbury Agricultural College, in a recent report.

The Cheaper Production of Fruit Cases.

D. B. FERGUSON, Assistant Orchardist, Hawkesbury Agricultural College.

ONE of the greatest factors influencing profits is the cost of production. If we recognise this fact we should also welcome any method which would lower the producing cost. The following article deals with a quicker, and consequently cheaper, method of case making.

Whether it would or would not be cheaper for a grower to make his own boxes is a matter for individual decision. Among the points to be considered are (1) the difference in cost of made-up boxes and those in the shook (probably 2d. per case), (2) the margin in freight from the mills to the packing shed on made-up boxes, and those not made up, and (3) whether at any time of the year there is a slack period which might be utilised in box-making.

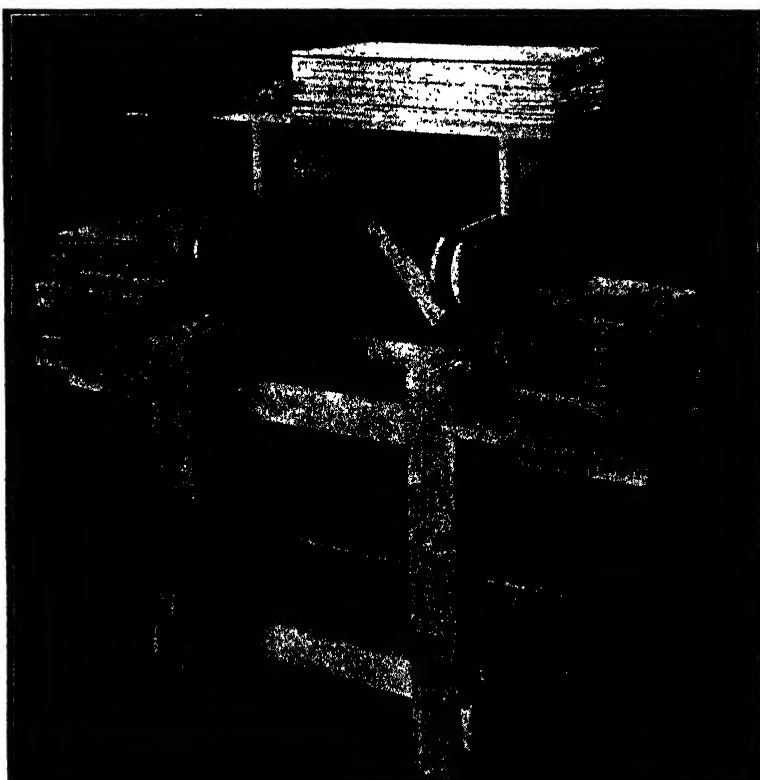


Fig. 1.—The Box Mould, used for making Fruit Cases at Hawkesbury Agricultural College. The lower portion of the nail stripper can be seen in the upper left-hand corner of the picture.

Fig. 2.—Operating the Box Mould.
One side having been nailed on to the end pieces, the position of the partly-made case is being altered to enable the bottom to be nailed on.

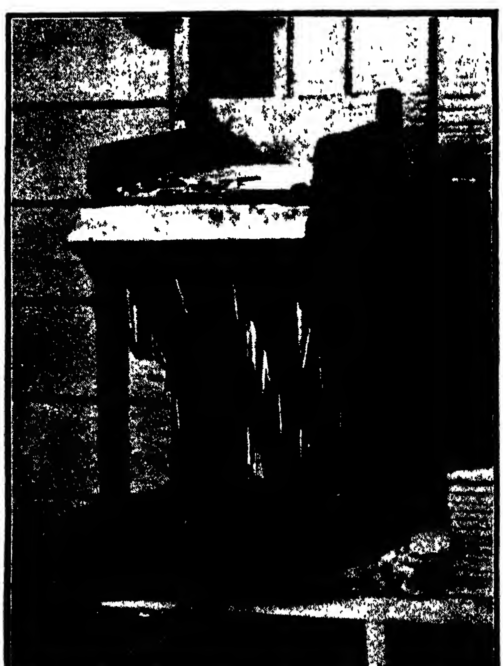


Fig. 3.—The Nail Stripper.

The Necessary Devices.

The box mould (Fig. 1) is the most expensive item, the total cost being approximately £2 10s. The material required is as follows:—

16 feet of 4 in. x 4 in. pine.
26 ,, 3 in. x 1 in. ,,
6 ,, 6 in. x 1 in. ,,
9 ,, 12 in. x 1 in. ,,
8 bolts, 4 in x ⅜ in.
4 ,, 3 in. x ⅜ in.
2 coil springs, 1 in. diam. x 1¼ in. long.

The height of the front legs is 2 feet 4 inches, and that of the back legs 3 feet 6 inches. The crosspieces, which are let into the top of the front legs

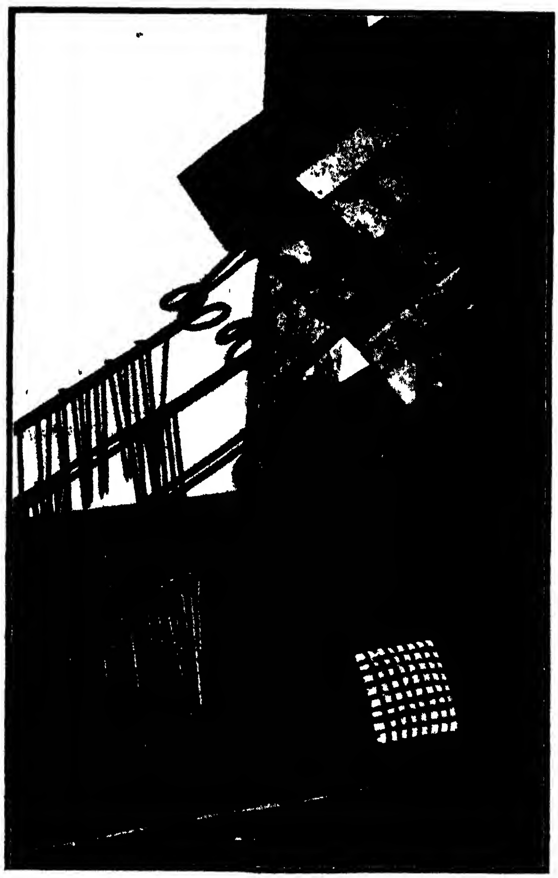


Fig. 4.—Withdrawing the Nails from the Stripper.

by means of a bridal joint, and mortised into the back legs in a similar manner, are 1 foot 10 inches in length. The manner in which the clamps are attached may be a little difficult to follow. The outer pieces of each

clamp are mortised rigid to the back legs, and are screwed permanently to the 3 in. x 1 in. uprights dividing the clamp. The inner leaf works with a pivot action from the centre, being forced apart at the rear by a spring, thus making the jaws capable of holding the box ends in place for nailing.

The box mould described was constructed for the production of the Canadian case (20 x 10 x 11½), but by slightly altering the distances between the clamps, &c., it is quite possible to produce cases of almost any other size.

The appliances required in the process of box-making are quite simple and can be made by anyone handy with tools. The nail stripper (Fig. 3)

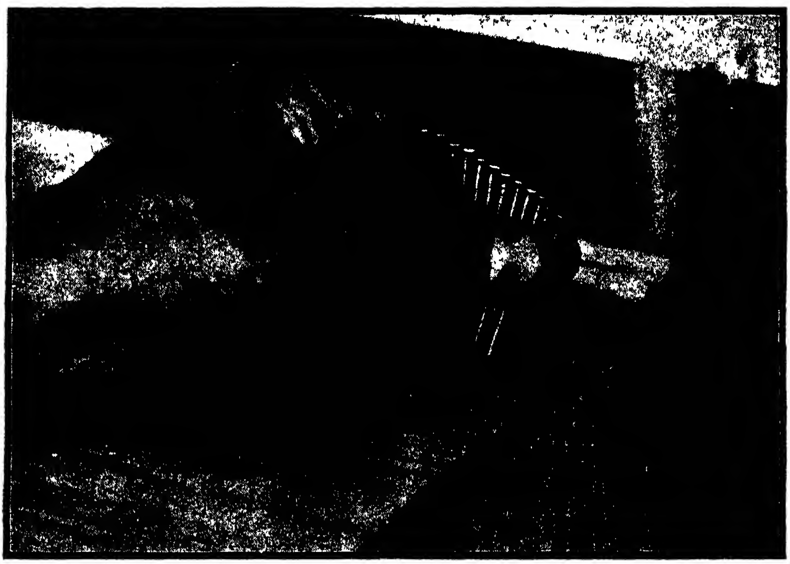


Fig. 5.—The Nails are held just as they were drawn from the Stripper.

was made by the writer from a kerosene tin, 5 super feet of pine and 16 feet of No. 10 galvanised wire, plus nails and screws. The total cost, covering material and labour, was approximately 10s.

The head of the hatchet (Fig. 6) is slightly rounded, with the surface roughened by a series of crisscross grooves. To convert a shingle hatchet into one of this type is an easy task for a blacksmith.

Making the Boxes.

The Box Mould.—The box mould is designed to hold the ends of the box in position, while the sides and bottom are being attached. This is done by the spring clamps between which the ends are placed. When one side has been nailed it is merely a matter of pulling the top forward and the bottom comes into position for nailing (Fig. 2). The same movement is repeated to bring the second side into nailing position.

With such a mould a man totally inexperienced in case-making should, with a few days practice, be capable of turning out 200 boxes per day, and one constantly employed at this occupation should not find difficulty in making between 350 and 400.

Measurements of Timber.

Some of our timber merchants who supply material for boxes do not cut to a standard size; that is to say, ends may vary anything from ½ to ¾ inches in thickness. As a box mould will not handle this class of shook efficiently it is necessary when ordering to insist upon material of the dimensions specified by the Department of Agriculture, these being recognised as the standard.

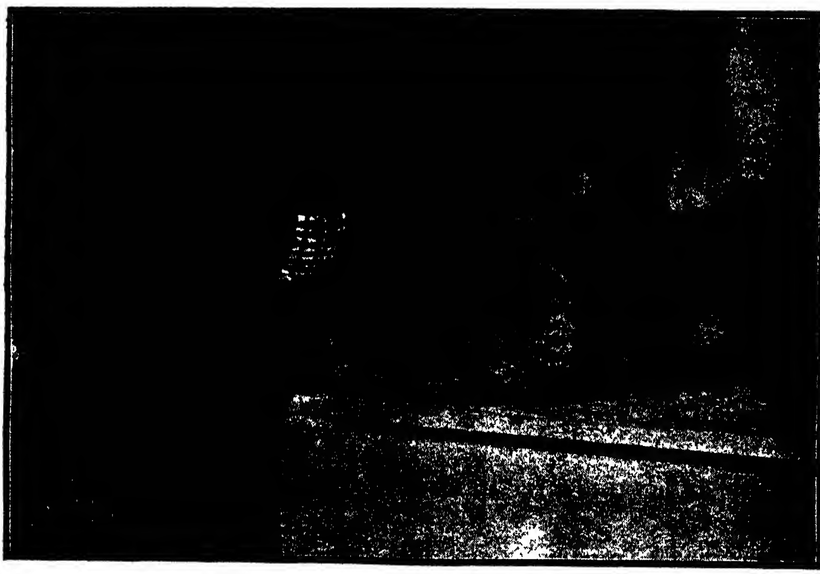


Fig. 6.—The Starting Stroke with the Bulged-faced Hatchet.

Conversing while in California with the manager of a citrus packing house in which box-making machinery had been installed, the writer was informed that the interest on capital invested in plant, plus depreciation and cost of repairs, power, and loss of time due to breakdown, brought the cost of machine-made boxes up to that of those made by hand in the manner described above.

Utilisation of the Devices.

The Nail Stripper.—The nail stripper is a device specially designed for filing out nails (1¾ in. x 13 flat head) in convenient order for driving (see Figs. 3 and 4). The nails are placed in the top tray, and by giving the aparatus a jar with the hand or hatchet, they are made to slide to the

tray below—the addition of a little powdered chalk will help them to slide freely. The second tray consists of four V-shaped grooves with spaces in the bottom just wide enough to allow the stem of the nail to pass through leaving it suspended by the head (Fig. 3). From this point they slide into parallel wires, from which they are easily extracted in the position illustrated (Fig. 4). The nail is started by a light tap with the tilted hatchet (Fig. 6), the hand containing the nails is simultaneously removed, the hatchet is straightened and the driving stroke made.

Some Requirements in Fruit Export.

No fact is more certain and immutable in regard to the British market than that quality pays first, last, and all the time, and that there is always a ready sale at remunerative prices for high-grade produce. So writes Sir Sydney Henn (member of the Imperial Economic Committee) and Mr. J. Sandeman Allen (Chairman, Liverpool Chamber of Commerce) in the *Journal* of the Royal Colonial Institute. Quality, however, is not the only consideration which must be taken into account. There is a psychological and predilectory aspect as well. Time and money are both wasted in trying to force on the British consumer an apple the flavour of which does not appeal to him. The function of the grower is to satisfy his customer's palate and not to educate it. Attention, too, must be paid to the size of the fruit, for this is taken strict account of by many a housewife with one eye on her purse and the other on the possibiliy of reconciling its limitations with the needs of her family, the members of which most certainly prefer a whole apple to a section of one.

Up to the Farmer.

When the average farmer realises that the two great problems, efficient production and systematic marketing, cannot be solved by any legislative body, but that their solution rests with him, much will have been accomplished to overcome the present farm crisis.—Oscar Erf, Ohio College of Agriculture, in *The Banker-Farmer.*

Boys and Girls' Clubs as a Stimulus to Thrift.

A country bank in Utah, situated in a comparatively isolated section over 100 miles from a railway, has during the last three years seen its junior deposits increase from 200 dollars to over 3,000 dollars, the gross value of property owned by these depositors rise to more than 14,000 dollars, and the dairy industry of the region increase fully 100 per cent. This bank, like every business unit in the community, says the reasons for these phenomenal increases are to be found in the successful boys' and girls' club work.—*The Banker-Farmer.*

Dipping Experiments with Whole Apricots.

Results at Yanco Experiment Farm.

W. W. COOKE, Orchardist.

THE time required to "pit" apricots, *i.e.*, to cut in two and remove the stone, is considerable, especially when expert labour is not available and the fruit is of medium or small size. The Department therefore decided to conduct experiments to find out if apricots could be dried whole satisfactorily, and if so, what treatment would produce dried fruit of the best quality with the least labour and in the shortest time. The following methods were tried:—

No. 1.—Dipping the fruit for various times in solutions of caustic soda of various strengths, and then sulphuring for the usual time.

No. 2.—As in No. 1, but with the stones removed with a special knife, the fruit still remaining whole.

No. 3.—Not dipped, but sprinkled with water and then sulphured for the usual time.

No. 4.—Not dipped, but stones removed as in No. 2, and sulphured.

No. 5.—Sulphured, but not otherwise treated.

In experiment No. 1 the following dipping periods and strengths of caustic soda were tested:—

(*a*) For 10 seconds in solution composed of 1 lb. of caustic soda to 30 gallons of water, boiling.

(*b*) For 5 seconds in solution as in (*a*).

(*c*) For 8 seconds in solution composed of 2 lb. caustic soda in 30 gallons water, boiling.

(*d*) For 5 seconds in solution as in (*c*).

(*e*) For 3 seconds in solution as in (*c*).

These experiments have been conducted for several years, so that the results might be fairly reliable.

It was soon seen that methods Nos. 2 and 4 (drying the fruit whole with stones removed) did not show any advantage in time saved over the ordinary process of pitting, as it took quite as long to remove the pits with the special knife as to cut the fruit in two in the usual way and remove the pits, while additional time was required with No. 2 for dipping. Though No. 2 yielded a far superior sample to No. 4, both were inferior to a fair average sample of pitted apricots.

Nos. 3 and 5 were more unsatisfactory still, the fruit being of a dark and unattractive colour, while the time required to dry these lots was three times as long as with method No. 1—a matter of considerable importance when quantities of fruit have to be treated, more trays being required and greater risks incurred from changes in the weather.

In the case of method No. 1 (fruit dipped and sulphured) all the lots were more or less satisfactory; the dried apricots had a good colour, and the time occupied in drying was not unreasonably long, the average over the period for which the experiment has been conducted being six days, as compared with eighteen days for the undipped fruit. There was a slight difference in the results obtained in the various lots in No. 1, the treatment that gave the best results one year not being quite as good the next, probably due to the state of ripeness of the fruit and weather conditions, &c., but lots (*b*), (*d*), and (*e*) gave the best average results, the quick dip evidently being the better method. The average amount of fresh fruit required to make one pound of dried fruit by method No. 1 over the period of the experiment was 4¼ lb.

In conclusion, it may be stated that dipping the whole apricots in caustic solution, as tried in (*b*), (*d*), or (*e*), and sulphuring, will yield dried fruit of good colour and appearance, and, provided ready sale can be found for whole apricots, this method is worthy of serious consideration. Fruit treated in this way has a distinct almond flavour, derived from the pit, which is absent in ordinary dried apricots. Before drying any great quantity of apricots whole it would be advisable for growers first to ascertain the probable demand and price from the Dried Fruits Association.

Manuring of Vines

Speaking generally, it may be said that sickly vines produce poor-quality fruit and light crops, and in order to maintain quality and quantity, manuring is deserving of every consideration where vines exhibit any inclination to weakness and low yields. Diminished yields from debility represent a loss in value of the crop which would fertilise the vineyard for some years. It is easier to maintain vigour than to renew it once the vines have been appreciably weakened.

It is estimated that vines will remove annually per acre from the soil approximately 40 lb. of potash, 45 lb. nitrogen, and 10 lb. phosphoric acid, and it would appear only reasonable to replace at any rate a portion of this each season.

Power on the Farm.

When one of our remote ancestors put the idea of tilling the soil into practice it is very difficult to say how he set about it. I think, however, that we can safely say that he either did all the work by hand himself or made somebody else do it for him. The man who first thought of making some long-suffering and stupid animal do the heavy work for him made a discovery, the importance of which he could not possibly have imagined. He introduced the idea of power to the world. It is tolerably certain that this discovery of power first came about in the agricultural world, and yet we find to-day that all the world over the agricultural industries are the most backward in its utilisation.—Lindsay Evans, at Singleton Agricultural Bureau Conference.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize:—

Fitzroy ... ... L. Waters, Yarramalong.
F. W. Hill, "Willow Vale," Yarramalong.

Leaming ... ... Manager, Experiment Farm, Grafton.

Funk's Yellow Dent ... ... N. C. Pyemont, Moondarra, Gundagai.

Broom Millet:—

White Italian ... ... W. Lye, Loomberah.

Sudan Grass:—

Manager, Experiment Farm, Cowra.

Sweet Sorghums:—

Collier ... . Manager, Experiment Farm, Grafton.

No. 61 ... ... Manager, Experiment Farm, Grafton.

Japanese Millet:—

Manager, Experiment Farm, Coonamble.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society and Secretary.		Date.
Murwillumbah (T. M. Kennedy)	Nov.	24, 25
Coramba (H. E. Hindmarsh)	Nov.	30, Dec. 1

1927.

Society and Secretary.		Date.
Dapto (E. G. Coghlan)	Jan.	14, 15
Kiama (G. A. Somerville)	"	25, 26
Wollongong (W. J. Cochrane)	"	27, 28, 29
Bellingen (F. Reynolds)	Feb.	3, 4, 5
Leeton (W. Roseworn)	"	8, 9
Tahmoor (E. S. Key)	"	11, 12
Wyong (H. Brown)	"	11, 12
Newcastle (E. J. Dann)	"	15 to 19
Pambula (L. K. Longhurst)	"	16, 17
Milton (F. W. Cork)	"	16, 17
Rydal (H. Murray)	"	18, 19
Gunning (G. E. Ardill)	"	22, 23
Oberon (F. B. Packer)	"	24, 25
Robertson (H. T. Carrick)	"	25, 26
Blacktown (J. McMurtrie)	"	25, 26
Bega ( )	March	2, 3
Tumut ( )	"	2, 3
Braidwood (R. L. Irwin)	"	2, 3
West Maitland (M. A. Brown)	"	2 to 5
Adaminaby P. L. Crisp)	"	3, 4
Moss Vale (W. Holt)	"	3, 4, 5
Glen Innes (G. A. Priest)	March	8, 9, 10
Bangalow (W. H. Reading)	"	9, 10
Taree (R. Plummer)	"	9, 10, 11
Batlow (C. S. Gregory)	"	15, 16
Cumnock (K. J. Abernethy)	"	16
Eden (H. P. Wellings)	"	16, 17
Gundagai (N. W. Holman)	"	16, 17
Blayney (J. H. Moore)	"	22, 25
Kempsey (N. W. Cameron)	"	23, 24, 25
Campbelltown (W. N. Rudd)	"	25, 26
Molong (W. P. Stanger)	"	29, 30
Orange (G. L. Williams)	"	29, 30, 31
Camden (G. V. Sidman)	"	31, Apl. 1, 2
Sydney Royal (G. C. Somerville)	April	11 to 20
Forster (W. Poppenhagen)	"	29, 30
Grafton (L. C. Lawson)	May	4, 5, 6, 7
Windsor (H. S. Johnston)	"	5, 6, 7
Dungog (W. H. Green)	"	11, 12, 13
Wagga Wagga (F. H. Croaker)	Aug.	23, 24, 25
Ganmain (C. C. Henderson)	Sept.	13, 14

Poultry Notes.

NOVEMBER.

JAMES HADLINGTON, Poultry Expert.

CONSIDERING the far-reaching effects, if put into practice, of some of the recommendations which emanated from the "Poultry and Egg Committee" at the Bathurst Conference in September, readers of these notes will doubtless be looking for more about what transpired there than has yet appeared.

A feature of the committee's work was the unanimity that prevailed on practically all questions, with the exception of the one which had for its objective a compulsory egg pool. On that there was a sharp cleavage, though every member of the committee was a "poolite"—voluntary or compulsory. It was fully recognised that only by pooling is the poultry-farmer likely to receive a price for his eggs commensurate with the cost of production.

On the question of protecting the public in the matter of quality and size of first-grade eggs, it was realised that, apart altogether from the factor of honesty and fair dealing, it was in the best interests of the industry that the would-be purchaser of fresh eggs should receive the protection he had a right to expect, and that action in this direction would enormously increase local consumption. It was also realised that it was not even a question of cold storage or otherwise—as is generaly imagined—but one of quality, and quality only, that should count. To this end, it was recommended that no egg having an air cell of greater diameter than a sixpence should be sold as fresh. The depth of such an air space would be $\frac{1}{8}$ inch.

Registration of all poultry-keepers was another recommendation that had in it the germ of intense organisation, of better statistical records of the industry's value, and of much improved marketing methods. It is undoubtedly true that the side-line producer in outback districts, where marketing facilities are not good, is the greatest menace to our egg trade, as his product affects not only the consumer, but also the farmer who is dependent upon poultry for his living.

The suggestion that hatcheries and farms where stud stock or eggs are sold should be brought under registration and inspection is another reform that has becomes necessary and to the credit of members of the committee who were vitally interested in the day-old chicken and stud stock trade, it should be said that they unanimously supported the recommendation, showing that they had no fears that common sense and moderation would not be the guiding principles in the control of these farms should legislation be enacted.

Side-lights on the Conference.

Apart altogether from the definite recommendations made by the committees, there were some side-lights that to many present were highly illuminating—perhaps to none more so than poultry-farmers, wheat-growers, and millers.

It has generally been assumed by poultry-farmers that the other two interests mentioned are to some extent antagonistic to their own. A meeting of the two latter interests, with representatives of the poultry industry present, disclosed at least some interests in common, and brought out others that should lead to mutual benefit. For instance, wheat-growers were given first-hand information of the extent to which poultry-farmers used their wheat. They were told that at least 4,000,000 bushels of wheat is required yearly for the poultry industry. On the other hand, the millers were told that poultry-farmers use some 11,000,000 bushels of pollard and bran. These facts were something of a surprise to both wheat-farmers and millers. It was shown, in this connection, that the poultry industry used up more wheat and wheat products than are required for the whole of the flour made into bread. Also, that while the poultry-farmer is now paying 7s. 4d. to 8s. per bushel for wheat, the bulk of wheat-farmers sold their wheat round about 5s. 6d. per bushel. The millers' representatives (unofficial) complained that if they were able to get all the wheat they required at its present London parity they could export flour to the East, and thus keep their mills fully employed for eleven months of the year; incidentally under those conditions they would produce very much more pollard and bran for poultry and other stock.

In this connection it was put to the millers' representatives that even if they exported on a larger scale, poultry-farmers or stock-raisers generally might not benefit. It was also put to them that in exporting their mill offal and keeping the price up as at present, they were sending out of business their permanent customer (the poultry-farmer), which action must later on react on the demand for these by-products.

It was shown that the cost of feeding in the poultry industry was so high last year that it cost the poultry-farmer 1s. 9d. per dozen to produce eggs, which he sold at 1s. 6d. per dozen. This loss, it was pointed out, had to come out of the earnings of the farmer for his labour. In consequence, it was estimated that 25 per cent. less chickens have been hatched during this season.

Wheat-growers, poultry-farmers, and millers were at one in advising the Government to hold sufficient wheat in the country to meet all requirements for local milling and consumption. The question of adulteration of mill offal also came up for discussion; the millers, however, disavowed any adulteration that was not already in the wheat; they averred that they simply put into the offal what came in in the wheat, and they said the remedy was cleaner wheat.

Thus it will be seen that poultry-farmers' difficulties were presented in such a way that they must share in any benefits arising out of this coming together of producers and consumers.

Weeds and Green Feed.

The poisonous properties of many weeds, and even of some fodder plants at certain stages (or if eaten in excess), is well known among big stock owners, but it is not generally recognised to what extent poultry become victims to unsuitable and even poisonous green stuff.

Many thousands of poultry are lost and many more are made ill (with a consequent loss of egg-production) as a result of eating weeds of various kinds. This is nearly always brought about by circumstances and environment. For instance, a shortage of suitable green feed will cause the birds to eat many weeds that they would not otherwise touch. This particularly applies to birds kept in bare yards or confined to houses. If let out such birds will eat amost anything green. Naturally they will eat suitable fodders if available, but if not they will often eat unsuitable ones.

Obviously, too, if such birds are let out of bare yards on to a perfectly good class of green food they will eat to excess, and trouble in the form of enteritis will often ensue. How much more serious then may the trouble become if there are present one or more injurious plants instead of good edible fodder plants or grass. Birds roaming on free range will rarely eat poisonous weeds or any fodder in excess.

Another way in which poultry-farmers encounter this trouble is in the green feed supplied to the pens. Take, for example, the farmer who is growing such crops as lucerne for green feed, cutting and feeding it to the birds in yards divested of any edible green feed whatever. Many cases come under notice where birds are dying or are falling off in production, where the cause is found to be some weed or unsuitable green feed that is being unsuspectingly fed with the other fodder, the farmer being under the impression that the birds will pick out only the suitable stuff. As a matter of fact, that is what would occur if there was sufficient of the good fodder, but in most such cases there is not, and hence the trouble.

Another source of trouble in connection with growing green feed for poultry, is that it is often cut and fed at a stage when it has become too fibrous, and even contains some dead matter, such as dead flag of barley, &c. The trouble in this connection arises not so much from the excessive fibre content, but from the fact that such dead matter often forms itself into balls and prevents the passage of the other food from the crop to the gizzard, the only portion of the anatomy of the bird that can deal with it. The result of this stoppage is what is known as "sour crop," a condition that arises from fermentation of the food that is held back long after it should have passed on to the gizzard.

It will be seen how necessary it is for the poultry-farmer to be ever on the alert to prevent these happenings. After all, no great mental or physical effort is involved, but simply caution and common sense, remembering always

that if birds are kept short of their requirements in the way of succulent green feed, they are likely to eat too much when let out on to pasture of any kind. In cases where birds have been so kept, and it is desired to let them out of bare yards on to a growth of vegetation of any kind (even grass, if succulent) it is best to let them on to it for only half an hour to an hour at a time, gradually lengthening the period each day for a few days before allowing full access to the new run.

Green Feed as an Adjunct.

Succulent green feed really constitutes only an adjunct to the ration of poultry, because the largest quantity the birds can eat can supply only a small amount of nutriment. Herein lies the cause of a good deal of falling off in production from a normal standard, and also in the size of eggs on some farms. Many cases come under notice where the true cause of the trouble has been quite unsuspected. This has been accentuated in recent months. Owing to the high cost of feeding some farmers having fed up to 50 and even 60 per cent. of succulent green food in place of the more concentrated foods, such as pollard, bran, and cereals. The farmer has to realise that it does not pay to merely keep hens alive. They must be fed well or disposed of. Certainly it does not pay to feed growing stock in this way.

Poisoning by Common Salt.

While on the subject of poisonous articles, it may be well to refer again to the liability of poultry to salt poisoning. Common salt given in right quantity and in the right way is as highly beneficial to poultry as to larger animals, but the susceptibility of poultry to poisoning by salt is most marked —by raw salt in particular. Most of the cases of salt poisoning coming under notice are from eating grains of raw salt, notably out of dry mash. There is considerable danger in dry mash hoppers where salt is mixed in the mash, particularly where the hoppers are filled up to last two and three weeks. Dry mash hoppers should be emptied and filled each week. Where that is not done there is danger, especially in damp weather, of the grains of salt clinging together and forming a mass of over-salty material, which, when eaten by the birds, results in salt poisoning. The same danger lurks in brine in which meat has been pickled, whether it is mixed with the food, or even thrown on the ground where poultry have access to it. Scraps from the kitchen containing salt are still another source of the same trouble, as is the addition of salt to mixed mashes which may already contain quite sufficient.

The quantity of salt used in the morning wet mash should not exceed 22 ounces to 100 lb. of food, calculated on dry weight, and the salt should first be completely dissolved in the liquid with which the mash is to be mixed.

As regards salt in dry mash, it will be best to use only about half the quantity stated for wet mash, and to ensure that it is very fine, dry, free from lumps, and thoroughly mixed through the mass. Only by such precautions can immunity from salt poisoning be insured.

Orchard Notes.

November.

W. J. ALLEN and W. LE GAY BRERETON.

During the early part of the summer it is most important to conserve soil moisture for the growth of the fruit and trees; consequently weed growth must be kept down and the surface prevented from crusting, and a dry soil mulch must be maintained.

What implement should be used for the purpose depends on the state of the soil. In some cases the tine cultivator is sufficient, but if frequent showers have held up previous cultivation and weeds have got beyond the cultivator then a light ploughing may be necessary. The one-way disc cultivators are useful implements for such work. There is one drawback to disc implements, however—they are liable to leave the fine soil on the surface and the clods underneath. The fine soil not only cakes again very easily, but also prevents further rains from penetrating easily. A good mulch is one that allows rains to penetrate, but at the same time checks evaporation from below.

If for any reason the soil has become set too hard for tine or one-way disc cultivator, then a mouldboard plough must be used. The mouldboard plough leaves the ground in good condition for receiving moisture, and also forms a more lasting mulch than the tine cultivator.

In some districts it is almost imperative to give a light summer ploughing to keep the soil in good condition for receiving and conserving moisture.

That part of the ground close to the butts of the trees which cannot be reached by horse or tractor implements must be kept clear of weeds and loose by the use of forked hoes or other hand tools.

Special attention should be paid to trees planted during the past planting season, as their roots are not properly established and can only draw their moisture from a limited area. During a prolonged dry spell these young trees may require watering. Where they cannot be irrigated in a regular manner a wide furrow should be opened up close in around each tree into which should be poured 8 to 10 gallons of water; when this has soaked away the furrow should be filled again with dry soil or some other mulch.

Codling Moth.

In previous notes instructions were given how to diminish the carry-over grubs by searching in the butts of trees and in the bandages, by dipping of cases or other receptacles that have held infested fruit (and where possible packing house appointments), by making packing or other sheds in which infested fruit has been held or handled moth-tight, and by killing emerging

moths that fly to the light at the windows. To get the full benefit of this work it must be carried out before the moths start to emerge from the carry-over grubs; if for any reason it has not been completed by now, do not give it up, but push it through to completion, as many of the carry-over grubs remain dormant, and do not emerge till comparatively late in the season.

Instructions have also been previously given for the first or calyx spray of lead arsenate. While the apples or pears are small the calyx represents a large proportion of the fruit, and even when closed the calyx offers a suitable place for the newly-hatched grub to start tunnelling. The calyx spray thus affords protection against the earlier grubs of the season, but as the fruit grows the calyx forms a smaller proportion of the fruit. Moreover, two fruits often touch one another and offer another convenient place for tunnelling; hence it is necessary to keep up frequent applications of arsenate of lead spray.

Remember, the first object is to reduce the carry-over grub; the next is to prevent those that escape from increasing by producing a second generation.

Often in the early part of the season the infestation appears negligible, and then, some time after Christmas, there comes a wave which nothing seems to stop. The secret is that the apparently negligible initial infestation has been allowed to run into a second generation, and the increase is astounding.

There are five methods of defence:—

(1) Frequent applications of spray as already mentioned.

(2) Hand-picking.—As soon as the tiny grubs start to eat their way in, make a systematic search through the trees, picking off all attacked fruit and destroying them by boiling. The grub is got while it is still in the fruit, and the catch is certain, whereas a grub that is allowed to eat its way through the fruit may or may not be caught in the bandage. This method is one of the quickest to show results in cleaning up a badly infested orchard. It is gratifying to note that the practice of hand-picking is increasing among growers.

(3) Bandaging.—Some grubs will escape both the spray and hand-picking, and by placing a convenient hiding place, such as a bandage, on the butt of the tree many of the grubs can be caught and prevented from producing a second generation.

(4) Collecting and boiling all infested fallen fruit at frequent intervals.

(5) Lastly, precautions against outside infestation. To spend money on moth control and then carry grubs from elsewhere to the orchard seems utter madness, and yet it is done every season by medium of second-hand and return cases. No used cases should be allowed in the orchard unless they have been previously dipped, or dipped at once on arrival at the orchard. The case must remain under boiling water at least three minutes to allow the water to penetrate to tight joints that may be concealing grubs.

Fruit Fly.

The regular collection and destruction of infested fruit is the chief method of checking this pest. In an extensive field trial carried out by the Entomological Branch last season a poison bait showed a very appreciable reduction in fly-infested fruit over the untreated plot. Of course, these trials will have to be carried over several seasons before it can be definitely stated how useful this poison bait will prove in assisting in the control of fruit fly, but growers are recommended to give it a trial.

A foliage poison spray made in accordance with the following formula is recommended:—The juice of 1 dozen oranges, or 18 peaches (reject fruit), 4 lb. molasses, 8 oz. arsenate of lead paste, or 5 oz. of arsenate of lead powder; water sufficient to make up to 4 gallons.

The spray is usually applied to the foliage at the rate of 3 to 4 oz. only per tree, with some suitable spray apparatus or syringe, not spraying the whole tree, but just applying the mixture in patches, care being taken, especially with peaches, to avoid the fruit, as the spray is likely to adhere to and show on them. The earlier the spraying is commenced before the fruit ripens the better; that is, it is better to commence seven or eight weeks before the fruit is pulled, but spraying four or five weeks before ripening is valuable. A fresh application should be made every seven days. This means, therefore, at least four applications, but preferably six. If rain occurs after the spray has been applied a fresh application will have to be made.

In recommending a trial of this bait it is not in any way suggested that the regular collecting and destruction of infected fruit should cease. This will remain the chief method of reducing the infestation of fruit fly. But it is hoped that baiting will prove a good auxiliary method.

Woolly Aphis.

In some orchards the woolly aphis parasite, *Aphelinus mali,* has become well established, and there is every indication that in these orchards the pest will be kept well under control without spraying.

All growers of aphis-liable apples who have not yet established the parasite in their orchards should make an effort to do so this season.

An article on this parasite by the Entomologist (Mr. Gurney) was published in the August issue of the *Agricultural Gazette.* It gives full directions about establishing the parasite in an apple orchard, and all apple-growers are advised to secure a copy of the article.

In orchards where the parasite is not established it will be necessary to spray with tobacco wash or nicotine sulphate to keep the pest in check. Field trials in the orchard at Glen Innes Experiment Farm have shown that 3 pints of miscible oil, incorporated with 100 gallons of tobacco wash or nicotine sulphate spray, has increased the efficiency of these sprays.

Leaflets on the control of woolly aphis and the mixing of tobacco wash may be obtained free of charge on application to the Under Secretary, Department of Agriculture, Sydney.

Black Spot of Apple and Pear.

In districts liable to this disease a look out must still be kept, and if a period of wet or foggy conditions occur apple and pear trees should be sprayed with lime-sulphur (summer strength) or Bordeaux mixture (6-4-50). Bordeaux mixture at this stage does not russet the fruit as badly as when applied earlier. Full details for treatment of black spot of apple and pear, and making and diluting lime-sulphur and Bordeaux mixture, may be secured from the Department in leaflet form.

Black Spot and Downy Mildew of Grape Vine.

If wet or muggy weather occurs, grape vines should be kept coated with Bordeaux mixture to protect them from these diseases. The vine grows very rapidly and the new growth is not protected by the earlier applications of the spray.

The After Care of Grafts and Buds.

Shoots that were budded during the previous growing period should have been cut back to start the inserted buds into growth when the natural buds of the stock showed signs of activity in the spring. It is generally far better that this cut should be made between 2 and 3 inches above the inserted bud, leaving a stub to which the tender shoot from the inserted bud can be tied as it extends; this lessens the chances of breakages from wind. Apart from tying, the projecting stub often offers protection to the tender shoots from birds resting, or the brushing of persons or horses when passing.

The buds on the stub above the inserted bud will start into growth, and if not attended to will likely sap the growth from the inserted bud. The way of dealing with these buds which entails the least work is to destroy them by picking them out with the thumb nail or secateurs when cutting back the shoots in the spring, and if one cannot depend on finding time to pay attention to the buds later, probably this is the best plan. However, the inserted buds appear to come away with a healthier growth if the buds in the stub above are allowed to start. When this is done it is necessary to pinch the growth from them later to prevent the growth from the inserted bud being sapped. The healthier growth from the inserted bud is probably due to the buds above drawing the sap, and later providing foliage which assists in elaborating the raw sap. After the growth from the inserted bud has grown out a few inches and has an established appearance, the growths from the stub above can be brushed off to avoid further attention.

Besides the growth from the buds on the stubs, many growths will start from the stock below the inserted buds, or from below grafts that have been inserted earlier in the spring of the current season. On nursery stock these growths are generally better rubbed off on sight, but on established trees that have been worked over with another variety, it is far better to

allow some of the growths from below the inserted buds or grafts to remain. However, attention is required or these growths may sap the growths from the buds or grafts.

Some of the shoots from below the buds or grafts will at once show great vigour, and are better rubbed off at once as they will be a constant menace. The weaker shoots are better allowed to remain but should be inspected occasionally, and if any shoot strongly they should be pinched or slashed back to prevent them sapping the growth from the inserted buds or grafts.

The advantages of leaving some growth on the stumps of worked-over trees below the buds or grafts are threefold. In the first place these growths provide some foliage to assist in the elaboration of the raw sap. It must be remembered that by cutting back the main limbs for grafting or budding the major part of the foliage is lost, and the roots thereby suffer partial starvation till sufficient growth is made to restore the balance between root and top. Secondly, the growth on the stumps shades the bark from the sun and promotes sap circulation, which prevents the sun from scalding the bark. Thirdly, the extra growth assists in protecting the tender new shoots from the inserted buds or grafts from breakages by wind.

Sometimes when working over established trees some limbs are left unworked; where this has been done it is often necessary to check their growth during the following growing season, or they will sap the growth from the buds or grafts too much.

The shoots from the inserted bud or graft should be interfered with as little as possible during the growing season, but when they make rapid growth it is necessary to pinch them back to prevent their being blown out by winds. For a year or two after they start they must also be cut back rather severely when pruning in the winter, to prevent too rapid extension till they are fairly established.

Superfluous inserted buds should not be removed for the first two or three years, till those selected for framing the tree are well established and there is reasonable certainty that they will not be blown out or lost by other mishaps.

Likewise, the superfluous scions on a grafted stump should be retained till the callous has spread well over and all round the cut edge of the stump. If only one scion is left on a thick stump the sap will not be drawn on the opposite side and the bark will often die away on that side. The extra scions around the stump keep the sap moving on all sides and hastens the callousing over of the wound.

Though the delay in cutting them out often creates a fairly big wound when the operation comes to be performed, such wounds are surrounded by the new callous and the liberal flow of sap causes them to heal over rapidly. As the growth from buds or grafts on re-worked established trees often develops very rapidly there is danger during the first few years, until the callous has crept well around, of their being broken out; for this reason it is wise to brace the new limbs with lashing or wires.

Agricultural Gazette of New South Wales.

Wheat-growing in the South-west and Riverina.

[Continued from page 809.]

E. S. CLAYTON, H.D.A., Senior Agricultural Instructor.

EXTENSION OF THE WHEAT BELT.

In the early days of wheat-growing in New South Wales, Young, Harden, and Cootamundra were considered reasonably safe districts, but bankers were not inclined to lend money to anyone attempting to grow wheat at Wyalong; even Temora was considered a little too dry and uncertain. If, at that time, anyone had suggested that wheat growing would be profitable at Lake Cargelligo and Rankin's Springs, he would have been considered a fit subject for an asylum. Yet at the present time wheat is being profitably grown at Rankin's Springs, Lake Cargelligo, and Hillston, and it is reasonably safe to expect the wheat belt to be still further extended, particularly towards the south-west. The production of suitable varieties of wheat, the judicious use of superphosphate, the adoption of "dry farming" cultivation methods, and a thorough knowledge of the climatic and soil conditions, have made possible the very satisfactory wheat yields obtained during the past few years.

In 1924, which was a good season, on the farmers' experiment plots at Lake Cargelligo (Mr. T. W. Turner's property), Federation yielded 30 bus. 56 lb. per acre, and Waratah 29 bus. 20 lb. (plots each 1 acre in area). These are exceptional yields and are quoted to show what has actually been obtained in this locality in a good season. Although such high yields will not be possible every year, if good methods are adopted payable yields will be obtained in all but the driest seasons. The yields at "Uabba" (Mr. G. C. P. Circuitt's property) are worth quoting together with Mr. Turner's. "Uabba" is situated on the Lachlan River, between Lake Cargelligo and Hillston; the soil is a light deep loam, red in colour. Experiments were commenced in 1924, and the yields were as follow:—

Yields per acre (with Federation Wheat).

	1923. bus. lb.	1924. bus. lb.	1925. bus. lb.
G. C. P. Circuitt	22 37	25 12	25 6
T. W. Turner	18 11	30 56	19 36

Rainfall on the Growing Crop.

	1923. Points.	1924. Points.	1925. Points.
G. C. P. Circuitt	1,348	684	735
T. W. Turner	1,218	935	851

Method.

Fallowing is absolutely essential to success in this portion of the State. Further, if fallowing is neglected in any way the resulting crop will be disappointing. The fallow should be ploughed early, and every effort made to

conserve as much moisture as possible; also to compact the sub-surface soil. It is a big mistake to plough deeply in this portion of the State, where the soils are usually light and rather deep. Many experienced wheatgrowers, accustomed to a heavy clay subsoil at a depth of 4 to 8 inches from the surface, are sceptical of the water-holding capacity of these light deep loams, and are often astounded at the yields obtained. It is in this connection that sound cultivation methods are depended on to improve the water-holding capacity of these deep soils. Consolidation of the sub-surface soil is more important here than in the more favoured districts, and more attention must be paid to it. Cultivation methods should be somewhat similar to those described for moderately dry climates, except that all cultural operations may be shallower. This country should not be ploughed deeply—3 to 3½ inches is sufficient. The mouldboard plough is preferable to the disc, and the springtooth cultivator and rigid tine scarifier are more suitable implements for working the fallow than the disc cultivator.

The fallow should not be over-cultivated before December; one deep springtoothing about the end of July is sufficient in normal years until January. From that month until sowing time two or three cultivations may be profitably given. The greatest possible use should be made of sheep for keeping the fallows clean and assisting the consolidation.

Summer fallowing is particularly advantageous in this part of the State, as it is so necessary to conserve all the moisture possible. The plough need not always be used for fallowing. On the light soils the rigid tine scarifier may be used in February or March. There is then no need to plough the fallow in the winter. It is not advisable, however, to always adopt this method; the land should at least be ploughed for every alternate crop. It is surprising how this country improves with cropping and cultivation, especially in the matter of consolidation and water-holding capacity.

Late maturing varieties should not be grown. To ensure success, it is necessary to sow midseason or early maturing varieties, and they must be sown early in the season. The summer comes in very quickly, and hot dry winds and high temperatures are experienced quite early in the season. The winters, however, are mild, and advantage must be taken of this fact to get the wheat in early and to have it growing during the cooler months. It is remarkable how well the wheat grows during the winter, and it is just this fact that makes wheat growing profitable in this part of the State. While the wheat crops at Young, Wagga, Henty, &c., are lying almost dormant in the cold winter, the crops at Lake Cargelligo are growing rapidly. The best varieties for grain are Federation, Waratah, Canberra, and Riverina, and for hay, Gresley and Early Bird.

Sowing should commence during the first week in April with Federation. During the second, third, and fourth weeks the early maturing varieties may be sown. Sowing should be completed by the end of April or early in May—the earlier the better. Late frosts in this part are infrequent and never very severe, and need not be feared. If the sowing is carried over into late May the crop suffers severely in the early summer and the yield will be

reduced. It is possible that even earlier sowing may be advisable for mid-season varieties, as some success has followed sowings made towards the end of March, but further experience is necessary before this point can be decided. It must be understood that the climate is quite different to that obtaining in eastern Riverina, and wheat is grown under quite different conditions.

Although the winters are so mild and so much growth takes place at this time of the year, crops never reach any great height, and they are usually very short. This, of course, is a great advantage in such a climate, as they are handier and less subject to wilting in dry winds or to lodging in boisterous weather. Although the crops are so short (usually 18 to 20 inches), it is surprising how well the heads fill provided the crop has been sown early.

This portion of the State is one of the most interesting from a wheat-growing point of view, and, although experiment work has been carried on here for only a few years, so much success has been achieved in this comparatively short space of time, and such excellent yields have been obtained that it augurs well for the further expansion of the wheat belt.

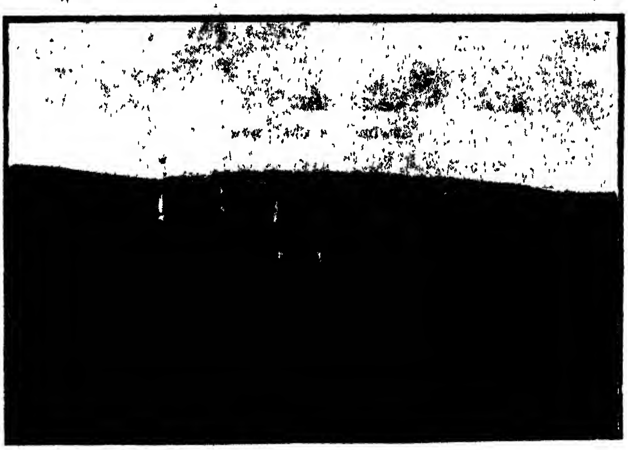
Summer Fallowing.

Long summer fallowing may, with advantage, be practised on practically all classes of soil, and although June and July fallowing only was mentioned in the foregoing notes (to avoid confusion), it is now pointed out that long summer fallowing can profitably be substituted for winter ploughing. By long summer fallowing is meant the ploughing of the soil to a depth of 3 to 4 inches as soon after harvest as possible, say, in January or February. If the soil is too hard to make ploughing possible at this date, the land can be cultivated to a depth of 2 to 3 inches with a rigid tine scarifier, springtooth cultivator, or disc cultivator, whichever is preferred. If the soil is only cultivated in the summer, it is generally necessary to plough it in the winter, especially if weed growth is very vigorous. If weeds are not troublesome it is not always necessary to plough in the winter. It is not advisable, however, to continue to grow crops continuously on fallows that have not been ploughed, except on certain very suitable soils—usually soils that are light in texture. Even on these very light soils it is not advisable to go too long without ploughing the soil, as the thorough aeration of the soil which follows ploughing is very essential to the maintenance of fertility. On the majority of heavy Riverina soils, the system of growing crops continuously on fallows which are only cultivated and not ploughed is not recommended. From winter onward, the long summer fallowing is treated in the same way as an ordinary winter fallow.

The chief advantage of long summer fallowing is that more moisture is conserved in the subsoil—the soil lying in a receptive condition for fifteen months, instead of the ten months usual when the land is not ploughed till July. It is also an invaluable method of cleaning up dirty lands, for black oats and weeds readily germinate on a summer-worked fallow. A better distribution of the work throughout the year is also obtained by this system.

The loss of the stubble feed, sacrificed by early burning and ploughing, is afterwards compensated for by the early vigorous growth of green feed on the cultivated land; also, of course, by the increased yield which can be expected in the subsequent crop of wheat.

This Surface is too Cloddy for Satisfactory Sowing and Germination.



Sowing the Plots at "Uabba," Lake Cargelligo.
The surface is too fine.

To economically utilise the feed available for sheep after harvest, it is recommended that the stubble intended for summer fallowing be the first to be grazed off, then it should be ploughed up, and the sheep transferred to the remaining stubble paddocks. If only half the area to be ploughed is summer fallowed, sufficient stubble will probably be available to maintain the sheep until the green feed is ready on the cultivated portion. It has

even been found that in most cases more and better feed will be produced on summer fallowed land than on the stubble of land left for winter ploughing.

Intensive Cultivation.

A farm is purely a business proposition and just as much attention should be paid to the business aspect as to the agricultural.

The cost of production must be closely watched and the net profit increased by the use of up-to-date and efficient plant. Intensive cultivations and heavy dressings of fertiliser tend to increase production; but a point exists beyond which additional cultivations or fertiliser fails to produce a corresponding increase in yield. An effort should be made by wheat growers to reach this point of maximum net profit. but not to pass it.

Sowing the Coolamon Plots.
The correct degree of cloddiness.

How to Prepare Stubble Land for Cropping.

Fallowing should, of course, be practised whenever possible, but occasions do arise when for various reasons a grower is forced to sow a portion of his land without fallowing it. It is thought advisable, therefore (although the sowing of stubble land is not recommended), to describe how best to prepare the land when this is necessary.

When it is intended to sow a crop on stubble land, the usual practice is to plough not long before sowing. The land is then worked down and sown, but this is not a satisfactory practice. Better results will be obtained from stubble land if the straw is burned as soon as possible after harvest, and the land either ploughed immediately, or, if it is too dry to plough, cultivated with a spring-tooth cultivator, scarifier, or disc cultivator. It can then be cultivated two or three times before sowing. If the weed growth is too vigorous, the land can be ploughed shallow before sowing; but this is not necessary if weeds are not allowed to get out of hand, and if the fallow has been well worked.

The short fallow, although not as advantageous as the long fallow, has much to recommend it in preference to sowing the crop soon after ploughing, and when it is necessary to sow stubble land in any district it should be adopted. Again, although some stubble feed is sacrificed when the stubble is burned, this loss is more than compensated for, not only by the quick growth of green feed on the cultivated land, but also by the resulting increased yield of wheat.

Burning the Stubble.

One of the most frequent questions asked is, "Would it not be advisable to occasionally plough in the straw left after harvesting, instead of burning it?" It can definitely be stated that it is always advisable to burn the stubble when preparing land for wheat. A good stubble burn is one of the best means of destroying fungus spores, and is therefore of great assistance in combating such diseases as flag smut, take-all, wheat blight, and wheat mildew.

The ploughing in of stubble, in addition to encouraging fungus diseases, also has a most objectionable effect on the physical condition of the soil, rendering it extremely difficult, if not impossible, to bring about a good consolidation of the sub-surface soil. The moisture-holding capacity of the soil is also affected temporarily.

The results of experiments in wheat districts throughout New South Wales indicate that wheat yields are reduced when the straw is ploughed in. This reduction in yield has in the past been chiefly attributed to the detrimental effect of the straw on the physical condition of the soil. However, in view of the results of recent investigations in the United States of America, it now seems that there is also a detrimental effect on the nitrogen content of the soil. The investigations referred showed that:—

(1) The ratio of nitrogen to carbon in soils, irrespective of their origin, is practically constant, and tends to remain so. Taking the carbon content as an index of the organic matter present in the soil, this indicates that the soil organic matter cannot be increased* unless additional nitrogen has also been provided.

(2) The nitrogen-carbon ratio in material returned to the soil has a marked influence on the kind and rate of decomposition. Organic matter, such as wheaten straw, having a wide nitrogen-carbon ratio (1 part nitrogen to 75 parts carbon) has a depressing effect on the development of nitrates when applied to the soil, and such effect is noticeable until there has been sufficient decomposition to cause the ratio to approach that of the organic matter of the soil. Green manure of a leguminous nature would have a narrow nitrogen-carbon ratio (1-10). If this were ploughed in there would be an immediate and rapid nitrate development. There would also be less loss of carbon-dioxide, and an indication of greater maintenance of organic content.†

* Washington Agricultural Experiment Station Bulletin 176 (1923).
† Washington Agricultural Experiment Station 31st Rept. (1921).

The application of straw to the soil stimulates the activities of bacteria, which use the straw as a source of carbon and the nitrates of the soil as a source of nitrogen. The nitrates are transformed into organic nitrogenous material, and for the time being are lost to the soil, as far as their availability is concerned. The more straw is ploughed in the greater is the loss of nitrates. Nearly all the carbon is lost as carbon-dioxide, and as this is the case non-leguminous crop residues, such as wheaten straw, cannot bring about any satisfactory increase in the amount of humus in the soil.

In the light of these results it now appears that, although straw is ploughed in with the idea of increasing the humus content of the soil, actually it would be no better in this respect than if the straw had been burnt, and would even result in a temporary loss of available nitrogen. From every point of view, therefore, the burning of wheaten or oaten straw is preferable to ploughing it in.

Maintaining Humus Content.

In view of these investigations it would also appear advisable to eat off such green stuff as wild oats, self-grown wheat, etc., rather than to plough it in, as the sheep would return most of the green stuff to the soil in a handier form. Much nitrogen also would be returned in the urine. To increase the humus content of the soil to any extent we must also increase the nitrogen content. This can best be done by ploughing in or feeding off a leguminous crop. There is great difficulty in finding a leguminous crop that can be economically fitted into the present system of wheat-growing. Although field peas grow well throughout most of the southern wheat belt, they have not up to the present been widely grown. The reasons for this are: (1) sheep do not eat them as readily as could be desired, (2) the expense of seeding, and (3) the difficulty of each year economically feeding off a large area of field peas. In the future, as sheep become more closely associated with the growing of wheat and as the areas become smaller, this problem of utilising green crops will tend to solve itself, but at present it is a serious drawback to the growing of leguminous crops.

Rotation experiments are being conducted at the experiment farms on this important matter, and the results should eventually be most valuable. At present it seems that the most economical and practical way of increasing the nitrogen and humus content of southern wheat soils is to make fuller use of the clovers and trefoils which usually grow there so luxuriantly. If these clovers are encouraged, they provide a leguminous crop which can be either fed off or ploughed in, and without any expense being incurred for seeding each year.

On heavy soils, trefoil and clover growth is exceptionally vigorous and persistent, and demands very little encouragement. On the lighter country, however, the clovers must be given more consideration. The application of heavy dressings of superphosphate to the wheat crops has been found to have a wonderfully stimulating effect on the growth of clovers, even on light soils. Dressings of 84 lb. to 112 lb. of superphosphate have a splendid

effect on clover growth in the subsequent stubble, and are often profitable for this season, even on soils where the wheat crop would not perhaps actually require quite so heavy a dressing.

Where vigorous growth occurs naturally or can be induced by heavy manuring it is thought that the most practical way of maintaining, or even increasing the humus content of the soil and incidentally of increasing wheat yields, is to adopt a rotation of wheat, pasture, and fallow.

Crop Rotation.

At the present time little attention is paid to actual crop rotation, but that some sort of rotation is becoming necessary is evident in many of the older wheat-growing areas. The Harden district can be quoted as an instance of the necessity of rotation. The country is undulating and the soils light. Continuous wheat-growing and fallowing has so depleted the organic content of these soils that they are extremely subject to surface washing. In

Sowing Experiment Plots at Young.

fact, some cultivated paddocks have been partially ruined through surface erosion. In the pioneering districts force of circumstances (chiefly lack of funds, the small proportion of cleared areas, and the pressing necessity for immediate returns), to some extent force the farmer to sow wheat continuously. Later, as a larger area of land is cleared bare fallowing is introduced, and portion of the crop is grown on fallowed land. In the older established districts the usual practice is to produce most of the crop on fallowed land, and only a small area of stubble land is sown.

In the older districts individual farmers are to be found who realise the limitations of a rotation consisting only of bare fallow and wheat. These men have varied the system by introducing either another cereal crop or a fodder crop, to be utilised by sheep or cattle, or by grazing the land for twelve months or more.

Let us consider these three systems. It can definitely be stated that for the greater portion of the south-western wheat belt the practice of continuous wheat growing without fallowing must be strongly condemned, for the

yields from stubble land are usually from 30 to 50 per cent. below those obtained when the land has been fallowed. As soon as circumstances permit, growers in the pioneering districts should discontinue sowing on stubble land. The surest way to increase wheat yields is to only sow on fallowed land. Such land gives heavier yields with less effort, and at a lower cost for labour and machinery. The rotation of wheat after bare fallow is certainly a great improvement over continuous wheat culture, and at the present time on most of the wheat soils gives excellent results. At the same time, this rotation to some extent tends to exhaust certain constituents of the soil, particularly humus, although it is not so objectionable in this respect as when wheat is sown continuously. Our wheat soils are usually very fertile, but it is to be expected that continuous wheat culture, or even wheat after bare fallow if persisted in, will eventually appreciably reduce their yielding powers, and indeed this is already evident in some of the older wheat districts. To maintain the soil at something approaching its original fertility it is necessary to adopt a more comprehensive rotation, and if possible one which includes the grazing of stock.

It is widely recognised that sheep play an important part in the economical working of a wheat farm, and a rotation system should be chosen with a view to increasing the number of sheep kept on the farm. This will not only increase the direct returns from the sheep section, but will also make possible the production of heavier wheat yields. The choosing of an economical rotation system is a very difficult problem. Locality, area of holding, soil, rainfall, and other factors must be considered before an effective system can be planned.

Some of the more general rotation systems may be discussed in a few paragraphs.

In many of the older districts a popular three-course rotation is wheat, oats, and bare fallow. The oat crop is grown for hay, grain, or grazing. In most of the favoured wheat districts, oats grow well after wheat, and the rotation is a very satisfactory one, possessing many advantages, including the control of flag smut. It is a rotation which can be recommended for most of the wheat belt where the rainfall is reliable. It is likely to eventually become very popular in New South Wales, as in the districts indicated good yields are obtained from oats, and the cost of growing oats on wheat stubble is very low; also the demand for oats is likely to increase as they become more popular among western graziers for feeding sheep. It is thought that the consumption of oats in New South Wales will increase year by year.

Where a difficulty is found in utilising such a large area of oats, it is often overcome by cutting half the oats for hay and using the remainder for grazing or grain. In the larger wheat districts a modification of the system may be adopted. Instead of sowing all the wheat stubble to oats, only half is sown, and the remainder is simply utilised for grazing; *e.g.*, where in a farm 900 acres are available, there could be 300 acres sown to wheat, 150 acres oats, 150 acres grazing, and 300 acres bare fallow.

The Mallee Rotation.

What is known as the Mallee rotation consists of wheat, pasture, and bare fallow. This is useful where, because of the low rainfall (or for other reasons), oats do not grow well, but where oats thrive, the wheat, oats, and bare fallow rotation is preferable. The Mallee rotation is particularly advantageous in the drier parts of the wheat belt; it is very popular in the drier parts of Victoria, where oats do not grow so satisfactorily. It has the advantage of enabling a small flock of sheep to be kept on a farm that otherwise might be considered too small to carry any sheep at all. For instance, on a farm of 1,000 acres in the drier parts of the State, 100 acres would be reserved for horse paddocks, etc., leaving 900 acres for cultivation; 300 acres of wheat would be grown each year, 300 acres of wheat stubble, self-sown wheat and grass would be grazed, and 300 acres would be bare fallowed. Superphosphate liberally used on the wheat crop has a residual effect which is noticeable in the subsequent grazing.

It is safe to anticipate that this 300 acres of grazing with the 300 acres of fallow in the dry parts of the southern wheat belt would carry, in normal seasons, from 200 to 400 sheep according to the nature of the soil. For maintaining or increasing the humus content of the soil, this rotation is particularly valuable, especially where clover and trefoils are encouraged to grow on the land during the pasturing period.

The "Wimmera" Rotation.

Where the rainfall is fairly reliable and the areas sufficiently large, a rotation consisting of wheat, oats, pasture, and bare fallow is sometimes adopted. This is called the Wimmera rotation, although it is not adopted to any great extent in the Wimmera district. It is a valuable rotation in certain districts, but it has a big limitation in that only a small area of wheat is grown. Only a quarter of the farm is sown each year with wheat, which is a disadvantage, especially on high-priced land, although this is compensated for to some extent by the greater number of sheep carried. From the point of view of maintaining fertility it is, of course, very satisfactory. This rotation permits of many modifications. Where Wimmera rye grass is grown it should prove more profitable than where the natural feed is depended on for the grazing during the third year. Various fodder crops could be substituted for the oats, *e.g.*, field peas, rape, barley, etc. Then again, on much of the land in the eastern Riverina lucerne grows very satisfactorily, and there is no reason why small areas should not be included in such a rotation. Lucerne, when it can be grown, increases the stock-carrying capacity of the farm to a greater extent than any other crop. It is therefore likely to be a tremendous factor in ultimately lifting our wheat areas from the ruck of a pioneering system, where practically the only crop grown is wheat, and placing them in the more permanent and prosperous position of true mixed farming districts, where stock occupy their proper place.

The disadvantage of including lucerne in the Wimmera rotation is that it occupies the land for to short a period considering the cost of establishment. Let us consider for a moment that wonderful stretch of country in the vicinity of Burrowa, Young, Harden, Cootamundra, Temora, Junee, Coolamon, Wagga, The Rock, Henty, Culcairn, and Corowa. In these districts excellent grazing lucerne may be grown, and if a rotation of wheat and bare fallow, or of wheat, oats, and bare fallow, is adopted on a mixed farm, to my mind the best way to profitably introduce lucerne into the rotation is to sow, say, 100 acres every fifth or sixth year. After growing lucerne for five years the 100-acre paddock would be ploughed up and would take its place in the wheat, oats, and fallow rotation, while another 100 acres would be sown to lucerne. Although sowing lucerne with a clover crop is not recommended when lucerne is required for cutting it is quite satisfactory in this district when grazing lucerne only is needed. If 6 or 7 lb. of lucerne is sown with the last crop of wheat a good stand will be obtained without losing the use of the land for any period whatever. The lucerne should not be sown deeply; it is best broadcasted on top after the wheat has been sown.

It has been stated previously that fallowing has been definitely proved to be necessary in the greater portion of the south-western wheat belt. There is, however, a stretch of country in the south where fallowing is not imperative. On the eastern side of the Riverina, a few miles east of Wagga and Junee, the country changes somewhat and the annual rainfall becomes heavier. In this particular locality fallowing is not generally necessary. The land is comparatively high-priced for growing wheat and is fertile. Although at present wheat is grown to some extent, other crops, including lucerne, are receiving attention, particularly on the Murrumbidgee River flats, and it is being gradually transferred into a true mixed farming district.

The same conditions obtain on the eastern side of Cootamundra. The land is fertile and the rainfall very satisfactory. It is not always necessary to fallow for wheat; in fact many of the best crops are produced without fallowing. Lucerne and other crops are taking the place of wheat in most of this district, and the area sown to wheat shows a considerable reduction. Some farmers in this locality will be compelled by various circumstances to always sow a small area of wheat. In fact, the climate is greatly suited to the production of excellent wheat crops, and if careful methods are adopted very heavy yields are possible. The hot, dry winds of summer are not nearly so severe as they are further west. Yields of 40 bushels per acre have been produced without fallowing.

As fat lamb raising occupies such an important place in the locality a rotation consisting of wheat, oats, fodder crop, and grazing is admirably suited to the more favoured portions of this district. In the slightly drier portions and extending westward towards Temora, the rotation should be modified to wheat, oats, fodder crop, and fallow, or wheat, oats, and fallow.

(To be continued.)

"Plant Nutrition and Crop Production."

Under the above title are presented the Hitchcock Lectures in the University of California for 1924. The Hitchcock Lectureship was established in 1909 for the purpose of giving the public the benefit of lectures on popular and scientific subjects, and eminent scholars have provided the lectures yearly since the foundation, but the year 1924 was the first occasion on which agricultural science was the subject of the series, and in the circumstances it was appropriate that the invitation to deliver the lectures should have been to Sir John Russell, the famous Director of Rothamsted Experiment Station in England.

Rothamsted is the oldest and most celebrated of all agricultural experiment stations, and Sir John Russell's distinguished contributions to the invaluable results accumulated there over three-quarters of a century qualify him in a singular degree for such a task as he assumed.

The titles of the five lectures afford an indication of the field covered: (1) The Study of Plant Nutrients; (2) Positive Science and Exact Demonstration; (3) Decay and the Living Plant; (4) The Soil Micro-organisms, can they be Controlled and Utilised? (5) The Soil and the Living Plant. The information presented is most attractively stated, and in a natural fluent style, not without literary touch, that makes the lectures a pleasure to read. Graphs and photographs contribute to the ease with which the matter can be followed, and the book is worthy of extensive distribution.

Our copy from the University of California Press, Berkeley, California. Price, 2½ dollars.

A Curious Wheat Crop.

The penalties of sowing a variety out of its season were illustrated in samples from a crop of wheat which reached the Department early in October from the West Wyalong district. The plants were quite abnormal, having only a few grains formed in rather aborted heads, and exhibiting second growth from the butts.

The accompanying letter stated that the farmer was sowing Turvey, but without his knowledge the men who were dry-pickling the seed got Canberra mixed with it, with the result that both wheats were put in the drill at the same time. Some rounds of the crop came up all Turvey, others all Canberra, and others again "real mixed up."

The cause of the abnormal growth was not difficult to assign. The plants were of Canberra wheat, which had been damaged by frost as a result of being sown in the last week in March. Mr. H. C. Stening, Chief Instructor, commenting on the matter, pointed out that Canberra should be sown late—about the middle of May. Sown as early as March, there was very great risk of a crop being damaged by frost near the critical stage of heading, especially if soil moisture were deficient. In the case in point, Canberra being much earlier than Turvey, the plants of the former variety would be frosted, while the latter would escape.

Under favourable conditions the "ratoon" crop might yield a fair crop, and if the new heads reached about the same height as those of the main crop by the time the latter ripened, it would be necessary to delay harvesting until the new heads ripened; otherwise, if there was much immature grain, it might heat in the bags, depreciating the whole lot.

The American County Agent.

AN AUSTRALIAN'S IMPRESSIONS.

[A good deal is heard from time to time about the county agent who in America fills a large place in the better farming propaganda. During a quite recent visit to the United States, Mr. D. Kelly, a well-known enthusiast for the Bureau in the Parkes district, collected some information and impressions which he has set down in the form of a report to the Advisory Council of the Agricultural Bureau of New South Wales. The following paragraphs are extracted.]

IN response to your request for a report upon the Farm Bureau of America and also upon the County Agent's place in American farming, I am enclosing herewith copies of Kansas Farm Act and the County Co-operative Act of Minnesota. These measures fully explain in detail the departmental machinery governing the working of the Farm Bureau and the County Agent in two of the largest agricultural counties in the United States of America, in which I was able to make some personal investigation.

As the Farm Bureau and the County Agent work together, and are interdependent upon each other, I thought it advisable to report conjointly regarding the institutions.

The method of organising the Farm Bureau of America is distinctly different from the New South Wales system of the Agricultural Bureau. The membership of the Farm Bureau would consist of a list of subscribers scattered all over a county, who would contribute to the salary of the County Agent, and would elect from their members an executive committee, or County Commissioners, as they are sometimes called.

These executive bodies have very wide powers, including the right to levy direct taxes upon the farmers of the county to provide all necessary finance for the support of the County Agent, &c. In this way a strong central body is created, which functions in a general way in all matters of interest to the agriculturists of the county, but it appears to me to greatly lack the interest centred in small local branches, which is so valuable a feature in our New South Wales system.

An American State county would generally include an area of about 30 miles square. These are divided into square mile sections or townships (as they are called), and with the Bureau indiscriminately spread over the whole area, the vital local interests, as stimulated by our own system, seemed to be lacking.

I found also that there was in some localities a strong feeling of antagonism among certain sections of the farmers, who considered they were not getting any direct benefits from the organisation and very bitterly resented having to contribute in direct taxes towards its upkeep. This feeling existed principally among the members of the Farmers' Union, a trading concern, running on co-operative lines.

The same remarks also apply to the County Agent and his work. I came into personal contact with several county agents, and the general impression was that they were not very happy in their work. They appeared to attempt too many things in a general way, giving a great deal of time to the commercial problems of individual farmers, and marketing problems generally.

While I was in one agent's office several men called in, inquiring for work on farms, and the agent told me that his time was mostly taken up with that kind of work during harvest time. The responsibility of collecting from the farmers subscriptions towards his salary rests upon the agent, and this circumstance very seriously depreciates both his status and his popularity in the community in which he has to work. In one State the County Agent was vested with powers to take action in respect of the Noxious Weeds Act against landholders who disobeyed the law, and in this regard he was expected to perform police duties.

Generally speaking, the County Agent was looked upon as a kind of handy man, at the beck and call of everybody. If a farmer had a sick cow, or his fowls had refused to lay, he sent for the County Agent, and woe betide him if things were not promptly rectified.

The conclusion arrived at from observations I was able to make was that in regard to both the American Farm Bureau and the County Agent, the New South Wales Government would be well advised to proceed to develop our Agricultural Bureau and district instructors along the lines at present adopted, as being much more likely to give general satisfaction to the agricultural interests of this State.

First International Congress of Soil Science.

In accordance with the decision of the Fourth International Conference of Soil Science, which met in Rome in May, 1924, the First Congress of the International Association of Soil Science then organised will meet on 13th June, 1927, at Washington, U.S.A. The congress will be followed by a field excursion to the various important soil belts of the country. Opportunity will also be given to the delegates to acquaint themselves with various agricultural industries, some of the leading agricultural experiment stations, and in general with the agricultural resources of the United States.

The association is made up of six International Commissions on (1) soil physics, (2) soil chemistry, (3) soil bacteriology, (4) soil fertility, (5) nomenclature, classification and cartography, and (6) the application of soil science to land cultivation.

The programme of each commission will consist, it is stated, of papers presented by invitation by outstanding investigators in the respective fields, and of contributions by various other workers in the different branches of soil science.

The Parkes Educational Tour.

And Some of Its Lessons.

W. H. BROWN, Editor of Publications.

The tour of the Parkes district, which originality, enterprise, and enthusiasm had arranged for the early part of October, with the object of affording wheat-growers and sheep-farmers an opportunity of seeing progressive methods in successful operation, was unanimously approved and enjoyed by all who attended. That the fixture should advertise the resources of that part of the west, was not, of course, unintended, but of much greater importance was the educational objective, and it was in the latter direction that the great majority of the visitors naturally addressed their inquiries.

For such a demonstration Parkes district is, perhaps, singularly suited. Situated toward the western extremity of the Central Western Slopes, where mild winter temperatures and warm summers mark the confines of the cool tablelands on the one hand and the hot western plains on the other hand, with lands almost equally attractive to the grazier and the farmer, and with soils of great variety demanding differing cultural methods every few miles, hardly anything more typical of the great variety of conditions occurring in the wheat and sheep belt of New South Wales could be desired.

Nor were the objects of the tour limited to an appeal to farmers from other districts. It was anticipated that local farmers, appreciating the opportunity of seeing what their neighbours do, and with what success, would join the procession and tour their own countryside. Hardly any better asset can be found for any agricultural community than the man who is ahead of others in his practice—who has studied his conditions with peculiar care, and benefiting by his observations has modified his farming accordingly. His returns—better than the average—indicate what the soil and climate are capable of, and thus enhance land values, while—even more important—he exercises a marked influence upon the farm practice of his neighbours. Thus farmers from all parts of the Goobang and surrounding shires had in the tour an opportunity of seeing how others do things, and of making comparisons on systematic lines. In every sense, therefore, the fixture was well named "The Parkes Educational Tour," and it happily and efficiently filled its title.

While farmers from all parts of New South Wales, from Victoria and South Australia, and commercial men from Sydney and other centres freely intermingled in the touring party, it was largely local farmers who made up the excellent total of 250, more or less, who faithfully followed the "official car" for three days.

The details of the tour had been most carefully worked out beforehand by the local committee, which had so well done its work that not a single delay or misadventure of any kind occurred. The Chairman of the Committee was Mr. J. Milthorpe, and the Secretary Mr. E. C. Brownhill. but

Parkes people were unanimous in attributing the idea originally to Mr. H. Bartlett, Senior Agricultural Instructor, stationed at Parkes, and he it was that supplied a great deal of the soil and crop data that made the tour so instructive, while as principal pilot he led the long string of cars for the three days over devious roads without a slip.

Soils of the Parkes District.

The soils of the Parkes district are of such variety that they are worthy of brief reference. The capital little guide book issued by the promoters of the tour related that the greater part of the area comprises soils of transport, derived mainly from granitic and basaltic formations, with occasional outcrops of limestone. These soils have been formed over long periods of time, being deposits from flood waters, changing river beds, water erosion, and wind transport.

It is evident that with such a derivation many diverse types of soils and subsoils have been formed, each requiring special treatment for the production of high-yielding crops. On the crests of the rises sedentary soils occur of red loam, often gravelly in character, usually 6 inches in depth, and overlying a clayey subsoil. Coarser and lighter soils of transport are often met with just before reaching level country, retentive subsoils sometimes being absent. On level stretches, where the fine soil particles, held in suspension, have had time to settle, the soil is usually of a clayey loam texture.

A general change in the type of country is apparent from east to west. From the Bumbury ranges, on the east, to within a few miles of Parkes, sandy loam soils predominate. Then, until about 10 miles west of Parkes, red loams are most common, and further west chocolate loams to clayey loams are situated around Gunningbland, Wongalea, and east of Trundle.

For practical wheat-growing purposes the soils of the district have been classified into five distinct types by Mr. Bartlett:—

(1) Red loam soils, 6 to 12 inches in depth, overlying a retentive clayey subsoil, usually found on the rises and slopes.

(2) Deep red loam soils, with no marked change in texture to a depth of more than 2 feet, such as occur adjacent to and on the east side of Parkes.

(3) Loams to sandy loams, 9 inches in depth, overlying a clayey subsoil, partaking more of the nature of silty soil, such as occur near Tichbourne.

(4) Deep clayey loams of the self-mulching type, usually found in myall country, areas of which occur at Gunningbland.

(5) Stiff clayey loams, overlying a clayey subsoil, such as occur in the Bogan country, west of Peak Hill.

The First Day.

The committee had planned everything so well that an ample number of cars was made available by residents of the town and by neighbouring farmers, and the few general rules that had been framed proved sufficient for

the comfort and safety of all. Proceedings began on 5th October with civic courtesies and a run round the town. At 1.30 p.m. a party of something over thirty cars started on a route which led eastward first through some deep red loams and then through some of the lighter soils of the district toward the Bumbury Hills.

The crops on the lighter lands were mostly suffering from excess of autumn and winter rains, and having necessarily been sown late were not so promising as what were seen later. Rich deposits of alluvial were to be seen in places and invited use for lucerne stands. Moving northward into broken hilly country of poor quality, the two fine reservoirs, from which the town of Parkes derives a supply of water that is the envy of many a western

Parkes Educational Tour.
The luncheon interval on the second day at Coradgery.

centre, were viewed, and then the procession debouched westward into the Goobang valley, where the soil once more improved to the familiar dark and red loams. Here the property of Mr. Richard Job, president of Goobang Shire Council, was visited, the pure seed plots conducted under the supervision of the Department receiving special attention.

Like a number of wheat-growers in different parts of the State—and several in Parkes district—Mr. Job, acting in conjunction with the Department through the Agricultural Bureau, raises crops which, having been inspected by departmental officers during growth and in the grain, are approved for sale as pure seed. The system is having a valuable influence upon wheat-growing in many parts, and its appreciation by farmers in the Parkes district is exemplified by the fact that last year fourteen such growers in the Goobang shire sold 84,500 bushels of pure seed wheat at 7s. 3d. and 7s. 6d. per bushel.

The average wheat yield on Mr. Job's property for the last six years has been 21 bushels, and the area under crop has averaged 450 acres. His favourite varieties are Yandilla King—of which a particularly good crop was seen—Canberra and Federation. From this farm—well equipped with a fine residence, sheep dip (used by others on co-operative lines), shearing shed, barn, water supply, and so forth—the party returned direct to Parkes, completing the first portion of the tour.

The Second Day.

Leaving the town at 8.30 a.m. on the 6th, the procession of cars (growing steadily until it ultimately numbered fifty or fifty-five) made in a northerly, and then in an easterly direction through red loams carrying here and there promising crops of wheat. A brief stop was made at Mr. A. Head's to inspect a stand of lucerne on wheat uplands (proof that that valuable legume is not limited to alluvial soils, and that therefore it might be much more widely used in the central west), and then a longer one at Mr. A. P. Unger's, where a nice crop of Canberra, promising ten bags to the acre, was visited. An area of crop adjoining, consisting of Federation and Nizam, was growing on the fallow which was awarded first place in the Parkes Fallow Competition a few months back. It promised twelve bags to the acre or more, and one farmer there was who viewed it with special interest —Mr. H. K. Nock, whose fallow at Nelungaloo was placed second to Mr. Unger's first. The situation in relation to the two crops was a highly interesting one, for there was no small possibility that in the forthcoming crop competition the positions of the two areas would be reversed.

The next stop was at Mr. S. J. Plowman's. Mr. Plowman has been interested in the crossing and selection of wheats for years, and he has succeeded in producing several varieties that are distinctly promising and that have their admirers in the district, notably No. 64, 4 U.G., 206, 210, 212B, 212C, and others. Of standard varieties several are grown here, and a reputation for good, sound seed has been built up. Federation, Canberra, and Gresley looked well, but a crop of Waratah was probably the best seen so far on the tour. The crops of Waratah, in fact, were a feature of the whole tour. The variety is rapidly increasing in favour as a short-season wheat and generally stands up better than Canberra.

Leaving Mr. Plowman's, the cars turned in the direction of Coradgery, where the station property of that name—one of the remaining grazing properties in the district—was observed for its sweet and ample pastures, and then "Beechmore," the home of Mr. J. Clatworthy, came in sight. The success of this farmer in the raising of fat lambs, and the valuable papers he has published from time to time, invested his paddocks, his stock, and his reserves of fodder with peculiar interest. With an area of 2,560 acres, 1,700 ewes are mated annually with fat lambs as the objective. Having found the Border Leicester cross the best for the purpose, Mr. Clatworthy a few years ago began to build up a small stud of that long wool type, at the head of which he now has a ram that was imported from

Canterbury Agricultural College, New Zealand. This ram was regarded as the pick of last season's drop at that institution, and is admired as of particularly fine type.

About 300 acres of wheat are sown annually, and portion of the crop is stored as hay, a derrick press being used to bale the hay, so that it occupies only one-third of the previous space and is more resistant to deterioration.

The stay at "Beechmore" was prolonged to enable the party to indulge in the luncheon that the ladies of Coradgery and Nelungaloo branches of the Bureau had prepared with lavish hospitality. At this stage the company numbered over 250 persons, and over sixty cars were parked among the belts of pines. Many residents of the district gathered together to welcome the touring party, and to join in the latter part of the day's proceedings.

Stud Border Leicester Ewes at "Beechmore."
Mr. J. Clatworthy rounded up his pure-bred Border Leicesters and also several pens of lambs for inspection.

Making southward now, "Milpose" and "Rockvale" homesteads were passed, the next inspection being at Mr. E. J. Johnson's "Iona" property, where pure seed plots came under review. The farm crops of Bena and Canberra wheats were equal to the best yet seen of those varieties, while a crop of Federation was adjudged by many to be the "top-notcher" of the tour. As with some of the crops of the morning, the features that occasioned remark were evenness and uniformity, and freedom from strangers and from oats and weeds.

Of the many crops that were passed on the roadsides, the remark must be made as to a number that wild oats were too prominent. That this is usual in the Parkes district need not be assumed, however. The autumn,

with frequent rains that in other respects were valuable, never afforded conditions for a good "kill" of the oats on some blocks, and they came away in full strength with the wheat. An element of good luck is no doubt necessary to the killing of this pest in any one season, but the lesson was surely rather conspicuous that the control of black oats is not a matter of a single year, but of consistent good farming, year in and year out. Odious as comparisons are, they were inevitable in the minds of many of the visitors as the absolute freedom from oats of the crops of Messrs. Unger, Plowman, Nock, and Watson was compared with the condition of some of those seen only from the road.

As "Iona" was left, and heads were turned for Parkes on this second evening of the tour, promising crops were passed mile after mile—some "oaty," but some level, clean, vigorous, and over the fence—affording promise of a good year for many a grower. Parkes district was surely going to live up to its reputation in 1926, in respect of all but late-sown crops on land that was "short of work."

The Third Day.

A grey morning, with clouds that had a woolly look in patches, suggested that perhaps the backward crops were going to get the rain they needed. The cars set off along roads parallel with those by which the town was reached the previous evening. The tour, so excellently arranged in all else, was not less so in that nowhere was the same ground covered twice, even for a mile or two.

Running direct west through rich chocolate to black clayey loams, carrying an ample cover of herbage and grass, "Nelungaloo," the property of Mr. H. K. Nock, was reached. Here magnificent crops of Canberra and Waratah were seen on the land placed second in the last fallow competition. For height, they were the most notable seen; anxiety might perhaps be felt for the Canberra under such conditions, but the Waratah could be expected to stand up better. A crop of Bena was the best yet seen of that variety.

These farmers of the central-west believe in substantial seedings. Sowing in May, Mr. Nock had used 65 lb. of Bena, and the quantity was not out of the way, having regard to other figures quoted. Superphosphate, too, is applied on all the properties we have mentioned—occasionally below 60 lb. per acre, but commonly over 65 and up to 75 lb. per acre of the high grade quality—which, in terms of the old 17 per cent. superphosphate, would mean 97 lb. per acre! The steady increase in the quantity of superphosphate which can be profitably applied to small cereals is something to which no farmer can afford to be indifferent.

And the effect of superphosphate upon the herbage and grass in seasons following the wheat is no less notable. The feed improves in quantity, quality, and palatability, and an important, if indirect profit, is thus derived from the sheep now everywhere associated with profitable wheat growing. Mr. Nock's experience with superphosphate has led him to try it on natural

pasture, and a trial on one paddock, part of which had been fenced off and top-dressed, while the other had been left untreated, provoked the greatest interest. The effect of the superphosphate was plainly manifest, and the comparative figures quoted as to carrying capacity were striking. Improvement of pastures by the sowing of grasses and clovers on prepared land has also engaged this farmer, and though the areas sown are small, their promise is most encouraging.

A Grain Silo on Mr. E. J. Johnson's Farm.

This silo (consisting of galvanised iron, set on a concrete base and reinforced with steel bars) cost £150 and is capable of holding 3,000 bushels. Such silos are proving so valuable as storage bins for oats or wheat that a number are now contemplated by western farmers. A smaller and less expensive type of silo (erected by Mr. W. W. Watson, of Tichbourne), was referred to in the *Gazette* in May last (page 349).

From Nelungaloo the chosen roads led generally southward, crossing the Goobang Creek on to country of lighter working loams. For years this class of soil was avoided for wheat growing, but Mr. W. W. Watson, among others, has proved that it can be utilised with excellent results, and to-day one can run for miles through capital crops, with occasional belts of timber which add picturesqueness to the scene and provide shelter for the stock. Some of the plots of wheat on Mr. Watson's property were among the best seen all this day, the features being density, evenness, and freedom from disease. One block was devoted to a fertiliser trial, high grade superphosphate being used on different blocks at 120 lb., 95 lb., and 60 lb. per acre—eloquent testimony to the substantially increased applications that

are taking place in the use of that fertiliser. Of the three blocks, the heaviest dressed looked the densest and promised the best yield, though it was early to estimate with certainty.

It was at Mr. Watson's that lunch was served. Unfortunately a short but rather sharp shower of rain fell just as the ladies of the Tichbourne and Daroobalgie branches of the Agricultural Bureau were ready for their visitors, and a hasty transfer had to be made from a shady group of trees to one of Mr. Watson's sheds. Happily the viands did not suffer in the process, nor was the "billy" (a big one) delayed for more than half an hour—so well was the change of plans organised. Quite 250 again partook of a great variety of edibles, and again expressed hearty appreciation of the hospitality of central-western ladies.

Inspecting the Crop at "Iona."
From fifty to sixty cars could be counted in the procession at times.

Crossing the main Forbes to Parkes road, many of the cars spent the afternoon in a slippery sort of a trip along the Back Yamma road, which disclosed heavy black and dark chocolate loams that make excellent grazing and good wheat lands. So devious was the road and skittish the behaviour of the cars that the occupants may be pardoned if, for a mile or two, they saw little beyond the fence line, but as conditions improved a red loam with a more sandy texture offered better holding and the countryside became more interesting.

The tour was brought to a close by arrival at Parkes according to time-table, and congratulations and farewells subsequently took place on the railway station.

The Evening Sessions.

Two evenings were spent in Parkes by the visitors, and for both the energetic committee had arranged programmes consistent with the character of the event. Addresses were given by Mr. A. H. E. McDonald (Superintendent), Dr. Noble (Principal Assistant Biologist), Mr. H. C. Stening

(Chief Instructor), Mr. H. G. Belschner (District Veterinary Officer), and Mr. H. Bartlett (Senior Agricultural Instructor), all of the Department of Agriculture, each outlining the activities in which he was specially interested.

Papers were also read by Mr. W. W. Watson on wheat growing in the Parkes district, by Mr. H. K. Nock on pasture improvement and fodder conservation, and by Mr. J. Clatworthy on fat lamb production. It is hoped that it will be possible to find opportunity for publishing these in some one or other of the Department's issues.

Opportunity was also taken on these evenings for the expression of the appreciation felt by the visitors for the conception of the tour and its successful fulfilment.

It is fitting that this very cursory review of the tour should close with a note of congratulation to the local committee, and in particular to Mr. H. Bartlett. The success that attended the carrying out of an idea, that in itself was altogether unique and of the greatest educational interest and value, must have been most gratifying to all concerned—it certainly was to all who accepted the invitation to be present.

The Younger Generation.

The tour described above was not the only one in which Parkes was interested this season. During September a party of senior students from Hawkesbury Agricultural College, accompanied by Mr. L. S. Harrison, Farm Foreman at the College, in the capacity of instructor in charge, visited Nelungaloo, Tichbourne, and Daroobalgie, covering much the same route as the third day of the Educational Tour. Local residents generously provided the cars for the tour, and turned out on a third occasion late in October to afford the older boys of Parkes educational institutions an opportunity of seeing the resources of their own district. The idea originated this time with Mr. D. Kelly, was warmly taken up by the P. and A. Association, and by Messrs. H. Bartlett, H. K. Nock, W. W. Watson, and others, the result being a day that provided a highly instructive outing for the boys.

Attractive Series of Illustrated Postcards.

An attractive series of illustrated postcards is being issued by the trustees of the Australian Museum, Sydney. The first series comprises thirty studies of birds, to be followed by a series of studies of mammals. The drawings have been approved as correct in technical detail, and constitute attractive examples of colour illustration, which should appeal to a wide public, at home and abroad.

The cards are on sale at the rate of 1s. per set of five, plus forwarding charges. A discount of 20 per cent. is allowed to institutions and educational authorities on any purchase (direct from the Museum) to the value of £1 and upwards. Orders and remittances should be addressed to the Secretary, the Australian Museum, College-street, Sydney.

Another Sheep Blow-fly Trap.

MANY different types of fly-traps have been invented since the blow-fly became such a serious pest of sheep, nearly all of them on similar principles, and making use of the fact that flies have a tendency to walk upwards and towards the light. In South Africa, as in this country, there has been a process of evolution, and of the addition of one improvement to another, until a trap has been produced which is figured and described by Mr. Bernard Smit, Entomologist at Grootfontein School of Agriculture, in the February, 1926, issue of the *Journal of the Department of Agriculture* of the Union of South Africa.

A sub-committee of the Research Council of the New South Wales Department, dealing with blow-fly infestation, has made trials of this trap, and the indications so far are greatly in favour of the new trap. The following paragraphs, together with the illustrations and figures, are taken from the South African *Journal*:—

How the Trap is Made.

The trap consists of two paraffin or petrol tins placed one above the other, and held in position by a strip of sheet metal (Fig. 1). The upper tin is the trap proper, and contains a wire-gauze cone or pyramid fastened in an upright position, its apex being 3 inches from the top of the tin, and its base secured on the inside of the bottom edge of the tin.

The first step in making the trap is to mark out the windows in the sides and top of the upper tin. Details of these apertures can best be seen in Figs. 1 and 2, pages 892 and 894. They are made of such a size that there is a strip of tin 1 inch wide left all around them, except at their lower sides, where the strip is 2 inches wide. This leaves enough of the tin to give rigidity to the trap, and enable the gauze to be fastened in place. Then mark out the hole "x" (Fig. 1), and the position of the cuts to be made in the bottom end of the tin as shown in Fig. 3. The round hole "x" (Fig. 1) is for the purpose of emptying the trap of flies when it is in operation. The hole is cut to fit the lid of a treacle tin, which is used to close it. Place the lid of a treacle tin with its inside surface against the side of the upper tin where it is to be fitted, and scratch around its inside edge with a nail. The window on the side in which this hole is to be made is made smaller than those on the other three sides of the tin, in order to leave plenty of room for making this hole. The upper edge of this window should be 5 inches from the top of the tin, and the upper edge of the hole "x" ½ inch from the top of the tin (Fig. 1).

Before cutting the apertures in the tin, small holes must be punched around the edges of the windows, using a thin nail and a hammer, and making the holes ½ inch from the apertures and 1 inch apart, as at "y"

(Fig. 1). These are for the purpose of sewing in the gauze windows, which is done with thin copper wire. The apertures are then cut with an old pair of scissors or a tin cutter. In cutting out the bottom end of the tin, a strip 1 inch wide is left all around the inside of its bottom edge. Slit this strip at the corners of the tin, as at "a" (Fig. 3), leaving four flaps, "b" as shown in the figure.

Improved Blow-fly Trap.
Note the position of the cone, and the support of the wooden wedge holding the lid in place.
[After *Journal of the Department of Agriculture*, South Africa.]

Two holes are punched with a stout nail, one at each side of the hole "x" (Fig. 1), and a stout piece of wire is bent through these over the hole, as shown in the figure. This piece of wire serves as a support for a wooden wedge, which is used to keep the treacle-tin lid in place while the trap is in operation.

D

The gauze is next fastened into the windows. Pieces of good 12 or 14 mesh wire gauze, preferably galvanized, are cut to fit the openings, so that there is an inch to spare on each side. They are fitted on the inside of the

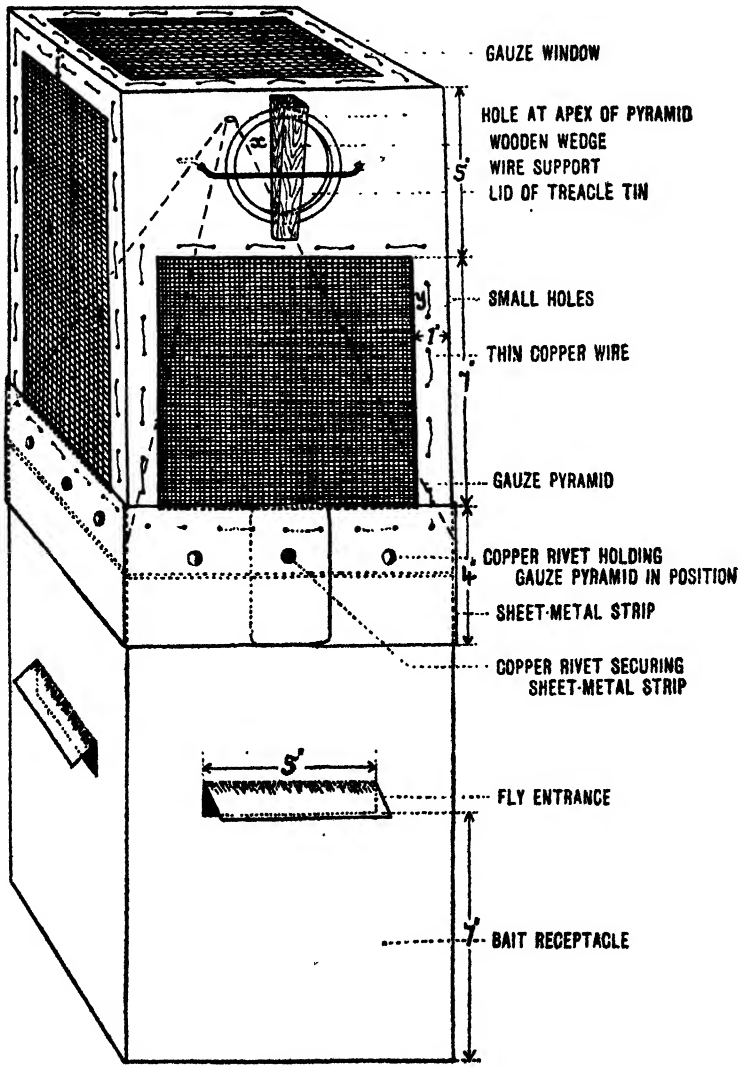


Figure 1.

tin and sewn in place with thin No. 22 standard gauge copper wire threaded through the holes "y" (Fig. 1). The square of gauze in the top of the trap should be sewn on first, then those in the sides, and finally the gauze cone is fastened in place.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The Construction of the Cone.

It is a common, but mistaken, idea that the cone of one of these traps is difficult to make. There is no difficulty if a little care is taken. It is best, however, to cut out a paper pattern of the cone, and when this is found to fit correctly, cut the gauze to coincide with it. The pyramid or cone has four sides to correspond to the sides of the trap, each side being a triangle with its base as long as the width of the trap, and its height nearly that of the height of the cone. The pattern is as shown in Fig. 4, on which the measurements are given. First strike out the arc of a circle with centre A and radius of 12 inches. Then mark off the points B, C, D, E, and F along this arc, so that they are 9¼ inches apart. Draw lines joining these points and to the point A, and proceed as shown in the figure. Strips of gauze 1 inch wide are left along the line AF, and at BC, CD, DE, and EF (Fig. 4), in order to sew the cone into shape and fasten it into the trap. The gauze, when cut to shape, is folded along the lines AC, AD, AE, and AF, so that the strip AF overlaps the edge AB, and these are then sewn together with copper wire, the same as was used for sewing in the windows. The apex of the cone will then be closed. After the cone is riveted into the trap a hole must be made in the top of it through which the flies are to enter. This is best done by pushing a thick pencil up through the tip of the pyramid; the gauze will part at this point, the thin wires bending aside, and leaving a round hole of the required size.

To fasten the cone into the trap, its base is fitted under the flaps "b" (Fig. 3), which were left on the inside edges of the bottom of the tin, and which are now bent inwards against its sides and secured tightly over the strips of the cone, BC, CD, DE, and EF (Fig. 4). The flaps are secured with split copper rivets, such as those used in harness-making. These rivets are put through the sides of the tin, the strips at the base of the cone and the flaps. Two rivets through each flap are sufficient (see section of upper tin, Fig. 2).

In order to keep the upper tin in position on the lower tin, a strip of sheet-metal or paraffin tin, 4 inches wide and 40 inches long, is riveted on the outside of the bottom edge of the upper tin. It is fastened so that it projects 2 inches below the edge and over the upper edge of the lower tin. Split copper rivets are used to fasten it in place. It serves to strengthen the trap in addition to keeping the tins in position. The ends of this strip will overlap on one side of the trap, and one rivet should be put through both ends at this point. The upper tin or trap proper is now complete.

The lower tin, or bait receptacle, consists simply of a petrol tin of the same size as that used for the upper tin. Its top is cut open and four slots are cut in its sides, through which the flies, attracted by the bait, enter. These slots, one on each side of the trap, are formed by making a horizontal cut, 5 inches long, at a distance of 7 inches from the bottom of the tin on each side. At each end of these cuts are perpendicular cuts, 1 inch long, running up from them. The flaps so produced are bent outward, as shown

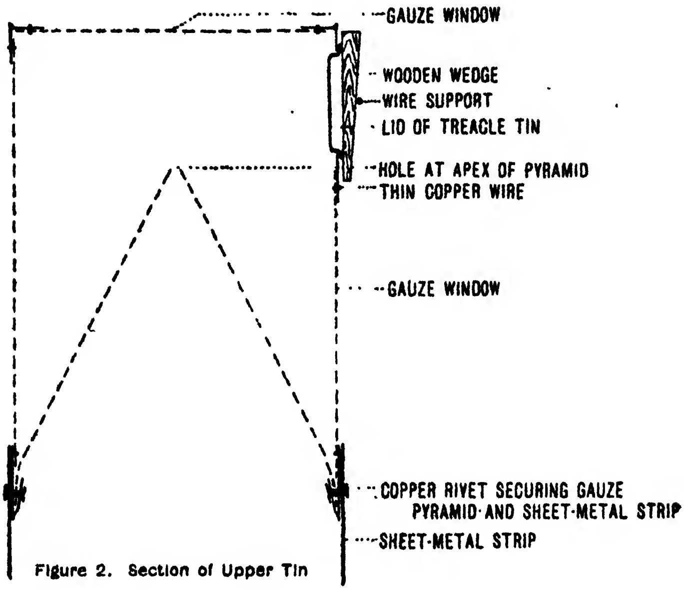


Figure 2. Section of Upper Tin

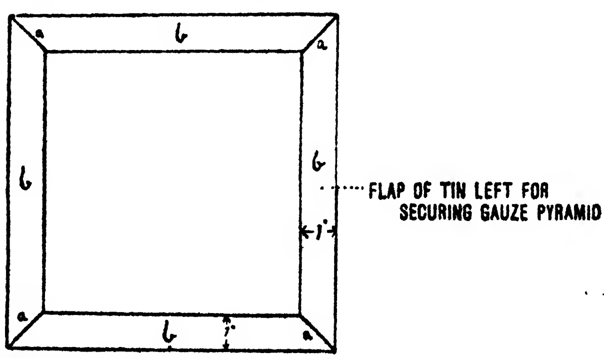


Figure 3. Bottom of Upper Tin

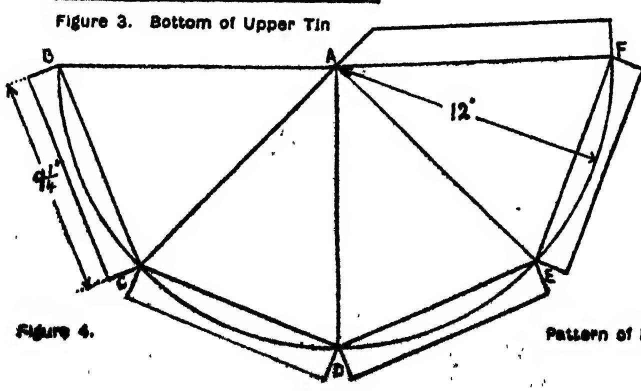


Figure 4. Pattern of Pyramid.

in Fig. 1. The object of these flaps is to prevent light from entering the slots, and so prevent the flies from being attracted out through them after entering. The flaps do not hinder the flies from entering, because the flies find their way to them by walking up the outside of the trap.

When completed, the trap, and particularly the inside of the lower tin, should be painted with good thick paint to prevent it from rusting. The gauze should not be painted, as this hinders light from shining through it.

Baiting the Traps.

The article from which the above descriptive matter is taken proceeds to discuss the subject of baits, but the bait recommended by Mr. W. B. Gurney, Government Entomologist, has been found quite effective. It consists of 3 to 4 lb. of bullock's liver in each trap, though if it is found utterly impossible to obtain liver, meat or a rabbit may be used. The bait should be renewed bi-monthly when the captured flies are removed. Two pints of water to which a teaspoonful of nicotine sulphate has been added should be poured over the bait bi-monthly, at least in the summer months, in order to keep the bait moist and kill the maggots.

A Variety Trial with Field Peas.

A TRIAL with three varieties of field peas was conducted on the farm of Mr. R. W. Hindmarsh, Wiaraga, Bellingen, last season, on land of an alluvial character which had previously been cropped with early maize. The area was broken up as soon as the maize had been harvested and was well cultivated prior to sowing, which took place on 28th May. The rainfall during the growing period was as follows:—June, 334 points; July, 405; August, 78; September, 30; total, 847 points.

Harvesting was carried out as each variety was flowering, the pods from the first flowers having commenced to fill. The results were as follows:—

Variety.	Date Harvested	Yield per acre. t.	c.	qr.
Lima	13th Sept.	4	12	1
French Grey	13th Sept.	4	8	1
Grey	12th Oct.	7	12	3

It will be seen that the Grey variety gave the heaviest yield, but it will also be noted that it was a month later in maturing than the other two varieties. This point is of great importance when the time which the land can be devoted to this crop has to be considered.

For growing in combination with winter cereals the early maturity of these two varieties is also worthy of consideration, particularly where field peas are grown in combination with early maturing winter cereals. Grey field peas make very slow growth during the early stages, and the quicker growing companion crop tends to smother them.—M. J. E. SQUIRE, Agricultural Instructor.

The Newer Varieties of Wheat.

Descriptive Notes of a Few.

[Concluded from page 728.]

J. T. PRIDHAM, H.D.A., Plant Breeder.

Penny.

Another midseason wheat; one of the Purple Straw group, resembling Dart's Imperial. The white, tip-awned head is rather clubbed at the tip. The straw is of good height, with a slight purple tint, and strong. The yellow grain is rather large and soft, threshing easily. Penny is very productive in a favourable season, and is a farmer's selection originating in Western Australia.

Riverina.

A sister to Canberra and selected at the Wagga Experiment Farm, ripening about the same time as Clarendon. The white head is slightly tapering and nearly bald, with white medium-stout straw and large yellow grain, easy to strip and classed as soft white. Riverina is a general purpose wheat for very dry districts.

Turvey.

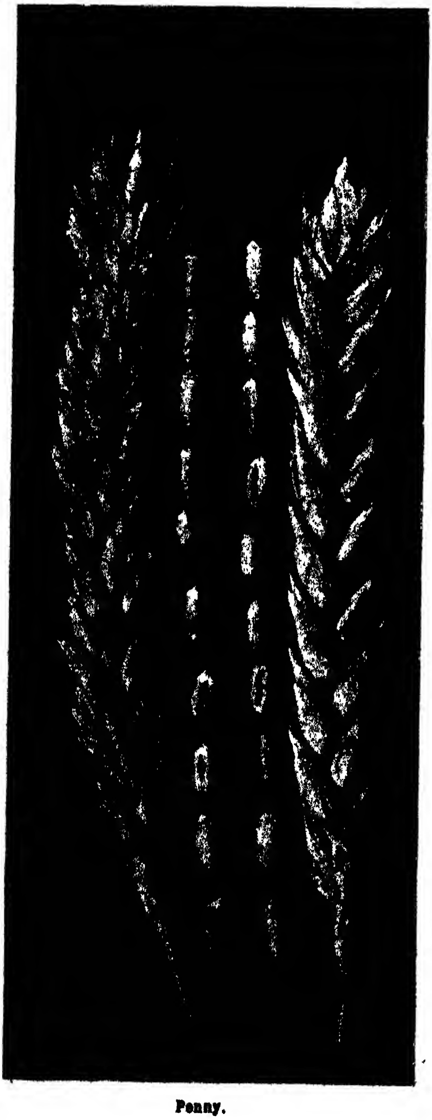
A late wheat, ripening with Zealand, Turvey is used for both hay and grain. It is one of the Purple Straw family, originating as a selection by Mr. Turvey, of Rochester, Victoria. The nodding white tip-awned tapering ears on tall, purple-tinted, not coarse straw make a very pretty crop, and Turvey has done well in field competitions. If stormy weather occurs near harvest time the variety becomes lodged and tangled, so that it is to be preferred for hay rather than grain. The white, rather large, grain is in the soft class.

Union.

Union has an awnless, uniform, brownish ear, with spikelets denser towards the tip than the base. It stools moderately, the foliage is not abundant, and the straw is short and not coarse. Union stands drought well, but succeeds best in the Riverina where there is an assured winter rainfall. It ripens at the same time as Bena, stripping particularly well, and does not shatter or lodge. It is an ideal grain wheat, but not tall enough as a rule for hay. Its white, medium-sized grain borders on the medium strong class. Union sprang from a cross made at Cowra between Federation and a crossbred with a long pedigree, having Fife-Indian and Purple Straw predominating. It appears to be less exacting in its requirements than its Federation parent, succeeding in drier and lighter soils.

Wandilla.

This useful variety ripens a day or two earlier than Marshall's No. 3. It has a white, tapering, long, almost bald ear. The white stout straw is of medium height, with dark-green foliage, stooling rather well. The soft grain is of regular shape, yellow, with fairly deep crease. Wandilla does not shatter and is a good general purpose wheat, apparently free from flag smut. Its pedigree is Federation x Yandilla King, the cross having been made at Wagga. Resembling Yandilla King a good deal, it is a little earlier and rather easier to thresh, suiting the same districts.



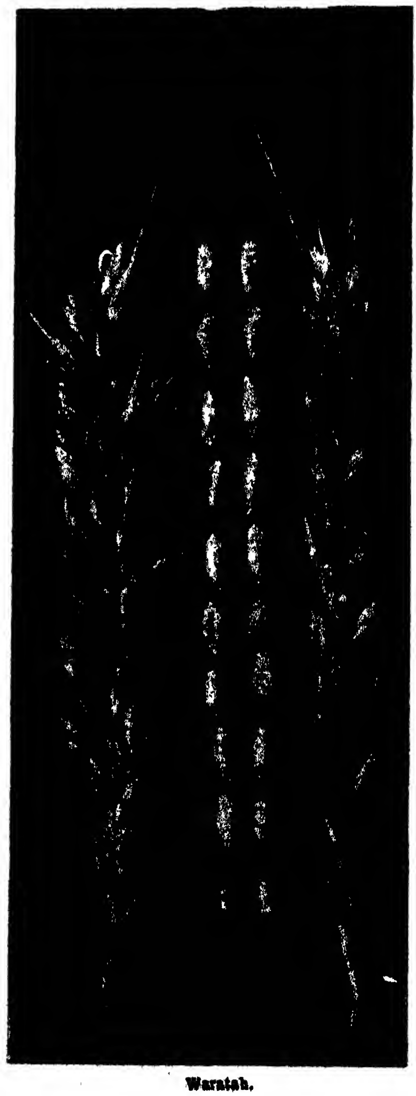
Penny.

Union.

Waratah.

Waratah is now widely grown. It has a medium to small head, brown in colour, with strong tip awns. The straw is inclined to be tall and slender, semi-solid, and not purple. Waratah weighs well for chaff, giving a high yield of hay, besides being very productive of grain. The stooling is not abundant, and the crop ripens at the same time as Canberra, to which it is a serious rival. The grain is dark yellow, soft, slightly elongated, and easy to strip, though it does not shatter. The cross was made by Mr. Hurst at Wagga, and the pedigree is Hudson's Early Purple Straw x Gluyas.

Wandilla.



Waratah.

Farmers' Experiment Plots.

MURRUMBIDGEE IRRIGATION AREAS, 1925-26.

W. R. WATKINS, H.D.A., Agricultural Instructor.

FERTILISER TRIALS WITH RICE.

THE following settlers co-operated with the Department in conducting trials with rice during the past season:—

M. Duffy, Farm 731, Wamoon.
Miss L. Grant, Farm 281, Leeton.
G. H. Bloncowe, Farm 240, Leeton.
R. Spicer, Farm 1008, Murrami.
C. W. Wynn, Farm 1078, Murrami.

Comparable results were only obtained from Farm 1078. Owing to the plots on Farms 731 and 1008 being overrun with barnyard or water grass (*Panicum crus-galli*) and stick weed or wild aster, harvesting was not carried out. On Farm 281 a splendid crop was grown, but owing to weather conditions several different methods of harvesting were tried, with the result that no check was kept of the yields. The plots on Farm 240 were not harvested, owing to wet conditions.

The Season.

The preparation of the land was considerably delayed owing to a late and wet winter, and in most cases ploughing did not commence till September. Frosts were experienced up till October, which delayed sowing of already prepared land. With the majority of crops sowing commenced about the middle of October, and germination was slow and uneven, as many as five waterings being necessary before the plants were sufficiently high for submergence to be carried out. Fairly cool weather up till December kept the crops backward, but once the hot weather commenced they evened up, and grew rapidly and showed their wonderful stooling characteristics.

The seasonal conditions of December, January, and February were very suitable for the crops, the days being hot and cloudless, there only being 67 points of rain during the three months.

During March the crops began to ripen off and no more water was allowed on the land, but just as harvesting operations were about to commence the weather broke and rain set in. Continued rains throughout April, May, June, and July considerably handicapped harvesting operations, the growers only being able to use the machines for a few days at a time when the land was sufficiently dry to carry them. A few of the growers overcame the difficulty, to a large extent, by attaching auxiliary power to the binders. The majority of the crops were harvested, but a few odd patches are (at the time of writing) still standing, due both to weather conditions and to unsuitable harvesting machinery.

The Trials.

Experimental work with rice during the past few years had shown that conditions, land, &c., were suitable for good returns, and as this was the first season the crop was being grown on a commercial basis to any extent and the prospects looked good, it was thought that with the use of fertilisers increased yields might be obtained. The fertilisers tried were used both on new land and on land that had been under rice the previous year, but as comparable results were obtained from only one farm no conclusion can be reached as to the benefit on old land. The rice-growers on the Area are well advised to give every consideration to the likelihood of beneficial results being obtained from the use of fertilisers, as the crop is an exhausting feeder and a big decrease in yield takes place on land sown to rice two years in succession.

The land on Farm 1078 had been previously cropped with oats, and was a red to a dark clay loam, ranging from 4 to 6 inches in depth, and overlying a heavy clay band. The land was sundercut to a depth of 3½ inches early in August, and sown about 2 inches deep on 15th October with a combine drill, the soil being in good order. The variety used was Caloro, and 100 lb. of seed was sown per acre in dry soil, which was flooded and drained a few days after sowing. The fertiliser was applied with the seed. Three waterings were necessary before germination was complete, the soil not being allowed to dry on the surface. Two more waterings were given before the plants had reached an average height of 6 to 8 inches, when the land was submerged to a depth of about 2 inches. The water level was raised as the crop grew until about 2 feet high, when a depth of from 5 to 7 inches had been reached on each bay. This depth was maintained throughout the growing period, until the heads had turned yellow and the grain was hardening, when no more water was allowed on the land. When the heads were well turned down, and the grain hard, all surplus water was drained off, and the land was allowed to dry for harvesting, which commenced in April but lasted over two months owing to wet conditions. The crop was cut with a binder, stacked, and threshed.

The following are the results of the trial:—

Fertiliser.	Quantity.	Yield.	
		bus.	lb.
Peanut meal	190 lb. per acre.	125	25†
P7*	100 ,, ,,	121	6
Dried blood	160 ,, ,,	112	8
Superphosphate	112 ,, ,,	107	30
No manure	....	86	0
Sulphate of ammonia ...	100 lb. per acre.	74	12

* The mixture P7 consists of equal parts of superphosphate and bonedust.
† Paddy rice goes 42 lb. to the bushel.

The peanut meal, which was supplied free by Marrickville Margarine Ltd., showed a noticeable difference; the germination was quicker and more even, and the crop grew better. The other fertilisers that gave an increase

made no noticeable difference to the growing crop, but the sulphate of ammonia caused a retarded growth in all trials. This is probably explained by the fact that the rice plant absorbs its nitrogen in the direct form of ammonia, and as the sulphate of ammonia was applied with the seed it was subjected to a chemical change, the nitrogen being present either as a nitrite or transformed into a nitrate when germination took place. Had the sulphate of ammonia been dissolved in the water, or applied to the land just prior to the second watering, in all probability the crop would have given an increased instead of a depressed yield. However, the price of sulphate of ammonia almost prohibits its use in large quantities, and from the above results P7 and superphosphate seem the most economical.

Although big increases are shown in the above results, due to the use of certain fertilisers, it must be remembered that no recommendations are made, as this is the first trial carried out. Further trials with superphosphate, P7, and peanut meal will be carried out during the season 1926-27.

MAIZE FOR GRAIN.

The following settlers co-operated with the Department in conducting trials with maize on the Yanco Area during the past season:—

J. Seppel, Farm 138, Leeton.
J. McCausland, Farm 333, Wamoon.
R. Farrar, Farm 796, Gogeldene.
S. Randall, Farm 1183, Merungle Hill.

Comparative results were only obtained on Farm 1183, due to the fact that the land was ready for planting at the beginning of December, whereas on the other farms planting could not be carried out until January. On top of this an early winter was experienced, the frosts catching the plants before the cobs had set. The late-sown plots received a set-back in their young growth, when water for irrigation was shut off from the end of January for about three weeks.

Although only small areas are cropped with maize for grain on the Area (this cereal being mostly grown for feed on the farm), it will be found that the best results are obtained from plantings made from the middle of November up till the middle of December. The land should receive a good preparation, being watered, if necessary, and cultivated before planting. If hand planting in furrows is to be done, it is advisable to carry it out on a dull day, if possible, as during these months winds are generally prevalent and evaporation is great, causing the open furrows to dry out very quickly. The ordinary wheat drill can be adjusted to sow the grain, and is recommended where a maize dropper is unobtainable. It is preferred to furrow planting at this time of the year, as the seed can be placed well down in the moist soil. However, a wheat drill is not always on hand, in which case furrow planting has to be resorted to.

The season was very dry, only 1½ inches of rain falling from December till March, and the majority of that at the latter end of March. Continued hot weather was experienced during these four months, and the crops received a set-back when water was unobtainable for some time.

The rainfall for the growing period was:—December, 2 points; January, 65; February, 0; March, 89; April, 448; May, 188; total, 792.

The trial on Farm 1183 was planted between rows of young fruit trees on friable red loam of good depth, there being no heavy clay band underlying the surface soil in this locality. The land was ploughed in the autumn and again in the spring, and kept in good tilth by continual cultivation. In November 3 inches of rain left the soil moist for sowing on 1st December. Furrows were opened with a plough about 4 inches deep and 3 feet apart, the seed being hand dropped, three grains every 3 feet, and the furrows harrowed in immediately after planting. Germination was patchy, but evened up later on, and when the plants were high enough shallow furrows were opened between the rows for watering. Harvesting was carried out on 9th June.

Variety Trial.	Yield.	
	bus.	lb.
Iowa Silvermine	61	49
Kennedy	60	50
Funk's Yellow Dent...	56	0
Funk's 90-day	54	0
Coodra Vale	46	9
Golden Superb	36	19
Golden Glow	35	25

Superphosphate at the rate of 70 lb. per acre was used with each variety. Iowa Silvermine and Funks' Yellow Dent again showed that they are very suitable varieties for the Area; for the past seven years these two varieties have done consistently well. Kennedy is another variety that does well under irrigation, although perhaps not so consistently as the other two.

A fertiliser trial with Iowa Silvermine was also conducted on the same farm, the results of which were as follows:—

Fertiliser per acre.	Yield.	
	bus.	lb.
Superphosphate 70 lb.	61	49
M13 91 ,, ...	45	10
M4 98 ,, ...	43	12
M14 112 ,, ...	40	21
No manure	29	26

The mixture M13 consist of 3 parts sulphate of potash and 10 parts superphosphate; M4 consists of 2 parts sulphate of ammonia and 5 parts superphosphate; M14 consists of 3 parts sulphate of potash and 5 parts superphosphate.

The need for fertilisers, and the increased yields obtained from using them, are very evident from the above results. The soils of the Area respond well to the use of fertilisers and perhaps the most economical is superphosphate, which always gives an increase in yields whenever used, especially on crops grown for grain. To sow a crop without at least 56 lb. of superphosphate per acre is false economy.

SUMMER GREEN FEED.

Of the six trials with crops for summer green feed, season 1925-26, comparable results were only obtained on two farms, the remainder having been ruined when a few inches high by a heavy hailstorm on 14th November.

The farms from which results were obtained were:—

R. Farrar, Farm 796, Gogelderie.
J. Oslington, Farm 353, Leeton.

The season was unfavourable for good growth of summer fodder crops, hot dry winds during October being followed by a heavy hailstorm in the middle of November, which ruined most of the crops sown in October, and then by hot dry weather during December, January, and February, when only 67 points of rain fell during the three months. An early commencement of the seasonal rains in March, which continued throughout the winter, prevented the majority of later crops from either being cut or fed off.

The rainfall during the growing period was:—October, 78 points; November, 279; December, 2; January, 65; February, 0; March, 89; April, 448; total, 961 points.

The plots on Farm 796 were sown on grey clay, which had been spring-ploughed and worked up for sowing in November. The land had been previously cropped with maize for green feed. The seed was sown through a wheat drill, every second hopper being blocked.

About 14 lb. of seed was sown per acre, and 70 lb. of superphosphate was used with each variety. Germination was patchy and the resulting growth slow. The plots were harvested on 14th May, and the results were as follows:—

Variety.	Yield		
	tons.	cwt.	qr.
Sumac	21	16	0
Sorghum No. 61	19	16	0
White African	19	13	0
Sorghum No. 34	16	18	1
Saccaline	15	9	2
Collier...	14	1	3

A fertiliser trial with Fitzroy maize was carried out on the same farm, the results of which were:—

Fertiliser per acre.	Yield.		
	tons.	cwt.	qr.
M13, at 182 lb.	17	18	1
M5, at 210 lb.	16	7	2
Superphosphate, at 140 lb.	15	12	0

The mixture M5 consists of 1 part sulphate of ammonia and 2 parts superphosphate.

On Farm 353, a fertiliser trial with Sudan grass was carried out on fairly heavy red clay, which had been spring-ploughed and cultivated down for sowing on 2nd November. The land had been previously cropped with feed millet. The seed was sown in drills 7 inches apart through a wheat drill. Germination was good, but the hail thinned the crop out considerably Plots were harvested on 22nd February, and resulted as follows:—

Fertiliser per acre.	Yield.		
	tons.	cwt.	qr.
Superphosphate, at 140 lb.	4	9	0
M5, at 210 lb.	2	15	1
M13, at 182 lb.	2	8	0

Farm Positions Sought for College Students.

The attention of farmers and station owners is directed to the fact that a number of students of Hawkesbury Agricultural College who have completed the College Diploma Course are desirous of gaining further practical experience, and will be available for positions at the end of the year. These students, who are about 19 to 21 years of age, have received a thorough grounding in the theory and practice of agriculture during the three years they have been in residence at the College, and should acquit themselves well at practically any branch of farm work.

Certain College students are also desirous of making use of the mid-summer vacation (extending from 16th December, 1926, to 26th January, 1927), for the gaining of practical experience on approved farms. These students are about 17 to 20 years of age.

Those desirous of obtaining the services of either students or ex-students might communicate direct with the Principal of Hawkesbury Agricultural College, Richmond.

Parcels Post Regulations.

The Postmaster-General's Department informs the Department of Agriculture that the stipulation that parcels must not be closed against inspection has been withdrawn, and it is hoped that this will have the effect of ensuring that parcels will be packed more securely than hitherto. The following rules, if observed, will save recipients the disappointment of receiving damaged parcels:—

Pack the contents so that they will not shift and break the covering; use plenty of packing around loose objects, particularly those of metal that have sharp edges; use good quality paper for wrapping; tie the parcel with strong string.

Although the stipulation referred to above has been withdrawn, parcels will, of course, still be subject to departmental examination when deemed necessary.

Green Fodder Competition.

SINGLETON DISTRICT.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THE Northern Agricultural Society apportioned three prizes, of £5, £3, and £2 respectively, to encourage the growing of winter fodder crops in the Singleton district. The contest was open to members of the Association and of the Agricultural Bureaux in the district.

The conditions provided that fertiliser could be used. Any variety of wheat, oats, rye, or legume (singly or in combination) could constitute the crop, which could be sown at any time (not less than 2 acres) and need not all be sown at the one time. Providing half an acre was reserved for inspection, the balance could be cut or fed off from time to time. Competitors were to provide a sheaf for the 1926 show; judging to take place between 21st August and 11th September, 1926.

The following scale of points was adopted as the basis of awards:—

	points.
Suitability of the crop for fodder	30
Stooling capacity and thickness of stand	15
Period of maturity	15
General appearance	15
Leafiness and greenness	15
Freedom from weeds and disease	10
Yield, 2 points for each ton of fodder	...
Equalising location and soil	30

Under the first heading more points would be allotted for a combination of cereal and legume. Concerning the period of maturity, the optimum stage is about the time when the plants are in flower, and it was considered that the best time for full green fodder value was within the period set apart for judging, as native pasturage is scarce at that time. For the adjustment of natural advantage 30 points were provided; the maximum handicap given was 8 points.

Fifteen entries were registered, but only eight were left in for judgment. It being the first district contest of this nature, entries of lucerne crops were accepted; but it would be advisable in future to make a separate class for this crop. Generally the growing period did not exceed four months—the winter months.

That, without fertiliser, crops of 12 tons per acre of green fodder, well headed and in flower, are not an uncommon occurrence at Singleton and in many other localities in this State, illustrates our natural endowment. Another striking feature is the very small amount of cultivation performed for such results. The possibilities with better cultivation, quicker maturing crops, and the use of fertilisers, are indicated by this competition, and farmers are advised to proceed along those lines.

TABLE of Awards.

Competitor.	Suitability.	Stooling and Stand.	Maturity.	General Appearance.	Leafiness.	Freedom from Weeds, &c.	Yield.	Equalising Location, &c.	Total Points.
A. Shearer	20	10	12	13	14	9	24	17	119
B. Knodler	20	11	13	13	15	7	20	16	115
Wright Bros.	20	11	11	11	10	6	18	24	111
C. Lambert	20	9	8	11	13	8	10	18	97
Faulkner and Hawkins	20	12	9	13	11	5	8	19	97
W. Thomas (Oats) ...	20	11	8	10	13	7	9	19	97
W. Thomas (Wheat) ...	20	7	12	9	7	4	16	19	94
W. Kauter	20	8	7	10	14	7	6	18	90

Mr. Shearer's oat crop at Maison Dieu was located on the banks of the Hunter River, the soil being deep alluvial loam. For some years prior to 1921 the land was occupied by lucerne, in 1922 it carried wheat, 1923 maize, 1924 oats, and 1925 maize. No fertiliser was added to the soil for any of these crops. The cultivation for the competition crop consisted of two ploughings, each approximating 9 inches deep, one early in April and the other early in May. The seed was broadcasted on the ploughed surface directly after each ploughing, at 1½ bushels per acre, and the seed was covered by harrowing. No fertiliser was applied. Two varieties of oats were sown, viz., Mulga and Sunrise, the first-mentioned in April and the latter in May. At inspection, Mulga was well in ear and lodged considerably. Sunrise had about half the ear showing and all standing; both averaged 5 feet in height.

This was the only entry that had two sowing periods and two varieties. Neither crop had been fed off or cut for stock at any early period. The crop was sufficiently leafy without being rank, and of a bright green colour, indicating quality. The stand was on the thin side and stools were not as plentiful as in some. The Sunrise stems were a little on the coarse side.

The crop was very free from weeds, a sprinkling of stagger weed of dwarfed growth being present. The surface soil had been worked down, and had a good, level, fine condition; only a slight discoloration of portion of the flag indicated reduced feeding value. The crop was estimated to cut 12 tons of green fodder per acre.

Mr. B. Knodler's entry consisted of Florence wheat. The soil is a deep alluvial loam on the banks of the Hunter River. Recent cropping consisted of lucerne for four years, with maize preceding the competing crop. No fertiliser has been added to the soil at any time. The land was ploughed 4 inches deep in April, the seed sown in June by broadcasting at the rate of 1 bushel per acre, and two harrowings were performed to cover the seed. The crop was not fed off or cut at any time. The crop averaged about 4 feet 6 inches in height, was well in ear, and at about the maximum feed

value. The stand was a little thin, but the stooling was good for the variety. The crop could have been denser—possibly another ½ bushel of seed per acre would have been advantageous.

Leafiness was satisfactory, and the colour of the crop and general appearance indicated good quality fodder. Rare patches of rank growth, showing slight mildew, were observed. The soil surface cultivation was rather uneven. Stagger weed, though not plentiful, with a small sprinkling of other weeds, slightly marred this fine crop, which was estimated to yield 10 tons of green fodder per acre. No portion of it had been fed off or cut.

Messrs. Wright Bros.' entry of Algerian oats was situated on a slightly sloping position, occasionally subject to flooding from an adjoining creek. The sedimentary deposit has produced a good soil, but not equal to the river flat soils, where some of the entries were located. Recent cropping consisted of maize and oats in 1923, maize, sorghum and lucerne in 1924, and oats in 1925. All were fed to dairy cows as green fodder. The oat crop of 1925 had 1 cwt. per acre of a maize fertiliser (proprietary mixture) applied with the seed. The land was ploughed 6 inches deep in January and 5 inches deep a month later, with an intervening harrowing. The Algerian oat seed was broadcasted at the rate of 1½ bushels per acre on 16th March on the ploughed land, and covered by two harrowings.

On inspection the crop was 3 feet to 5 feet high, well headed, and at about the maximum feed value. There was a little more flag discoloration than in the two foregoing entries, and the colour generally was slightly inferior, but in stooling, stand, and freedom from weeds it was very good. A little flag rust and wilting of flag were the only diseases. Although far from being in a poor position, this entry was allowed 8 points over Mr. Knodler's scratch entry. The crop was estimated to yield 9 tons of green fodder per acre, and had not been cut or fed off since sown. Adjoining the entry was a crop of oats and vetches—a good combination for green fodder. It was sown later, and had so far only made about a 15-inch growth.

All the plots in the competition were valuable in their way, and the fixture cannot but be useful in directing attention to the possibilities of sound methods of fodder production in this district.

Crossbred Sheep at Hawkesbury Agricultural College.

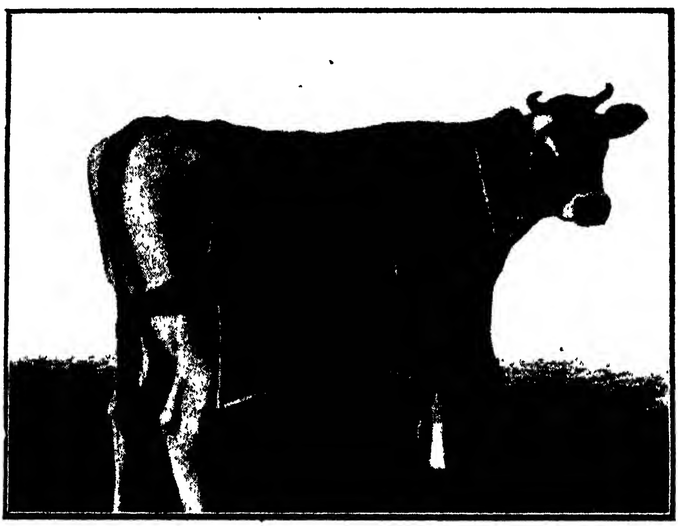
If due provision is made for supplementary fodder and precautions are taken to prevent worm infestation, it would appear that crossbred sheep can be raised here as successfully as Romney Marsh. A draft of fifty lambs was sold during the year. The return from the Comeback flock for the year was 25s. per ewe (wool 10s. 4d., and lambs 14s. 8d.). The lambing percentage of the Romney Marsh stud flock was 72·6 per cent., as compared with 73·2 per cent. for the Comeback commercial flock. The wool average of the Romney Marsh flock was 11 lb. 8 oz., as compared with 8 lb. 12 oz. for the Comeback flock.—E. A. Southee, Principal.

Cheap Rugs for Dairy Cows.

I. W. SCOTT, H.D.D., Assistant Dairy Instructor.

THE mild character of the winter on the North Coast renders it unnecessary to make very much provision for shelter for cows. However, windbreaks in the form of trees, hedges, &c., and the rugging of the cows in milk fo' portion of the winter, help greatly in maintaining the milk flow.

It is fairly common in the country mentioned to see a herd rugged in the manner illustrated in the accompanying block during portion of the winter, and the idea is one that should appeal to thrifty dairymen and stock lovers.



Practical Dairymen have proved the value of these Rugs for North Coast conditions.

Many farmers would like to rug their cows, yet cannot afford to purchase the market article. The farmer can make his own cow rugs for little more than the cost of the bags, a ball of twine, and a sewing needle, plus his own ingenuity. Two bags (cornsacks or any heavy bags will do), or three for larger cows, will make a nice rug. Split them down the seams and join together, place on the cow, and sew together in front of the cow's brisket; next join the back with a 4-inch strip of bag about 12 or 18 inches below the rump level, and the rug is complete.

This home-made rug will keep the cow warm, and after a few days' wear, when the oil, &c., from the cow's body has worked into the rug, it will also be waterproof. The rug can quite easily be slipped off and on over the cow's head. The cow's name painted on the rug over the rump with tar prevents confusion in replacing the rugs.

Farmers' Experiment Plots.

MAIZE TRIALS, 1925-26.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

As most of the main varieties are now extensively grown, through medium of the maize competition plots, which have superseded the farmers' private trials, the latter are now only established in outlying places or where they are especially inquired for. There is, however, a very keen demand for pure seed of all varieties in most centres from growers desirous of improving their strains, or from those who are substituting a better yielding variety for one that has proved unsatisfactory. Much seed is distributed annually in consequence of such changes. The undermentioned ran plots during the past season:

E. H. Ducat, Temagog, Macleay River.
H. Abbott, Wingham, Manning River.
H. Deer, Bulby Brush.
T. Gallagher, junior, Krambach.
John Dorney, Upper Myall River.

Pure seed was distributed to the following:—

Fitzroy.—Dempsey Bros., Taree; W. Murray, Kolodong; J. Dorney, Upper Myall.

Leaming.—C. Ainsworth, Macleay R.; E. M. Trotter, Beechwood; M. Smith, Paterson; Alex Smith, Bandon Grove; W. Lee, Hannamvale; J. Campbell, Wingham; J. Milligan, Bulby; J. Booth, junior, Temagog.

Funk's Yellow Dent.—S. Flett, Taree; J. P. Mooney, Dumaresq Is.

Golden Superb.—T. B. Yates, Gloucester; H. Bullsworth, Hannamvale; J. Milligan, Bulby.

Manning Silvermine.—S. Ebbeck, Vacy; F. Flett, Taree; P. Barry, Markwell.

Hickory King.—F. Flett, Taree; S. Ebbeck, Vacy.

The Season.

September and October were mostly dry throughout, with continuous dry westerly winds. These conditions were not favourable to good germination in the early plots. During November, December, and part of January the conditions were very wet, and good growth took place. For the remainder of January, all February, and part of March, dry, hot weather, accompanied by hot westerly winds, prevailed, and much damage was done to the maize crops in all stages, more particularly a number of pure seed plots which were sown late and were caught at the tasselling stages. The remainder of the season was wet, and this caused blight in a number of cases.

The Plots.

Temagog.—Sandy, loamy soil, previously cropped with maize, well worked. Sown, 17th December, 1925, rather late, especially for the early varieties; germination good; crop ran into a very dry period at tasselling time: early varieties were too uneven to take accurate yields from.

Bulby.—A fertile alluvial flat, heavy loam; land previously sown to maize; well worked; sown rather late, 13th November; fertilised with superphosphate, about 2½ cwt. per acre. Germination very good, but grain sown rather too close. Growth tall and dense; ran into the dry late summer spell.

Upper Myall River.—A fertile alluvial flat which had grown maize for a number of years previously; land ploughed early, spelled and ploughed again before sowing in October. Germination good, and crop looked well, but it ran into a very dry late summer spell, which considerably decreased the yields; still, under the circumstances, they were very good.

Wingham.—This plot was sown on a very rich piece of brush alluvial land, which had been well prepared; sown in October. Germination mostly good and the early growth satisfactory. Being of a light nature, the soil dried out considerably during the droughty late summer months. So hopeless did the crop look that it was decided to let the cows have the benefit of the few remaining green leaves and stalks.

Krambach.—Plot was sown on a creek flat at the end of November. Good germination took place, and the crop did well until the droughty period arrived. This it withstood fairly well, only to be destroyed by a terrific hail and wind storm in March.

The following are the yields from the three plots that were harvested:—

Varieties.	Upper Myall.	Bulby.	Temagog.
	bus. lb.	bus. lb.	bus. lb.
White Horsetooth ...	......	95 0	......
Ulmarra Whitecap ...	......	83 20	......
Pride of Hawkesbury ...	108 32	77 33	92 0
Yellow Hogan	......	91 11	......
Large Red Hogan ...	......	77 10	82 28
Fitzroy	85 40	75 0	90 0
Leaming	104 46	70 44	92 14
Golden Beauty	91 34	68 21	......
Craig Mitchell	......	......	77 0
Farmer's Fitzroy ...	74 6	......	......

Infectious Diseases Reported in October.

THE following outbreaks of the more important infectious diseases were reported during the month of October, 1926:—

Anthrax	1
Pleuro-pneumonia contagiosa	11
Piroplasmosis (tick fever)	Nil.
Swine fever	Nil.
Blackleg	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

Kikuyu Grass.

Trial at Wollongbar Experiment Farm.

R. N. MEDLEY, H.D.A., Experimentalist.

This grass is fast gaining popularity among the dairy farmers on the North Coast on account of its ability to produce a heavy bulk of succulent fodder, its power to withstand heavy stocking, and its usefulness as a change pasture from paspalum for the cows.

The manner in which this grass produces an abundance of green fodder throughout the year, more especially during the warmer seasons, has been well demonstrated by the results obtained at this farm. A pasture of it was laid down in a prepared soil six years ago, and after being allowed to become established has been continuously grazed since. The pasture has always provided ample fodder; the grass has shown a marked ability to make fresh growth (so valuable for the milking herd) even under adverse conditions and much later into the winter than paspalum and other summer grasses. During last winter the output of new growth was unceasing, and even during a dry spell of over five weeks in July and August no noticeable falling off was observed.

At the time of writing the grass covers the ground in a dense mass to a depth of 15 inches in spite of heavy grazings. A conservative estimate of the carrying capacity of this pasture is three cows per acre. The pasture consists wholly of Kikuyu grass. The growth is so vigorous as to choke out all other plants.

Two years ago roots of this grass were worked into an old paspalum pasture that had just been ploughed, the roots being placed 6 feet apart each way. The pasture is now composed of 70 per cent. Kikuyu grass. The paspalum is being steadily crowded out, although it came through thickly after the ploughing.

An examination of the root development of this grass will reveal its powers to withstand dry conditions and grazing and to make fresh growth rapidly. There is a dense mass of roots from 5 to 6 inches in thickness, individual roots penetrating to even a greater depth. To gain some idea of the root matter formed, a sod was removed from the pasture to a depth of 5½ inches, washed free of soil, dried and weighed, and for purposes of comparison a sod of paspalum was taken from an equally stocked pasture and treated in a like manner. The amounts of root matter to a depth of 5½ inches and green fodder per acre were calculated as follows:—

	Root matter per acre.			Green fodder per acre.		
	t.	c.	q.	t.	c.	q.
Kikuyu Grass	28	1	3	7	10	2
Paspalum	26	0	0	3	17	0

The grasses were cut with a scythe to ground level.

It is not intended to convey the impression that this grass is extremely drought-resistant; it is not, but under North Coast conditions it is certainly superior to paspalum in its powers to resist frost and dry conditions and in yielding capacity. It is capable of carrying more stock per acre, and is at least palatable. Dairy stock, after being grazed on Kikuyu grass for a few days, show a marked increase in the milk yield.

In addition to its value to the dairy farmer, Kikuyu grass makes a good forage crop for pigs, and farmers have begun to plant roots in yards. It is a grass with great possibilities, on account of the ease with which it is propagated and the vigour of its growth. Working horses relish it, eating it so closely as to keep it almost like a lawn.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th September, 1926.

Description.	Imports.	Exports
Interstate.		
	Cases	Cases.
Fresh Fruits ...	620,760	161,937
Tomatoes ..	132,722	...
		Bus.
Melons ...	.. ..	57
	lb.	lb.
Canned Fruits .	17,136	1,372
Dried Fruits—		
Unspecified ...	14,028	168
Currants ..	15,904	504
Raisins ..	6,440	364
Apricots ..	812	112
Apples ...	1,260	280
Prunes ...	2,128	56
Pears	1,148	...
Sultanas ..	532	...
Peaches ..	1,120	...
Dates . ..	168	..

Description.	Country of Origin.	Imports.	Exports
Oversea.			
Fresh Fruits—		Cental.	Cental.
Citrus	... .	91	26,816
Apples .	....	1	1,190
Pears	....	...	209
Pineapples ...	.. ..	...	3,312
Bananas ...	... .	1,575	84
Other	... .	447	940
Dried Fruits—		lb.	lb.
Apples, Pears, Peaches, etc.	U.S.A.	1,400	...
Apples ...	....	...	3,418
Apricots ...	... .	...	216
Currants ..	....	...	82,534
Prunes ...	France	24	887
,, ...	U.S.A.	16,633	...
Peaches ...	.. ..	...	104
Raisins—			
Sultanas ...	....	...	1,124
Other ..	U.S.A. ...	12,170	892
Dates	....	...	27,310
	Mesopotamia ..	21,573	...
Other	..	..	3,810
	China	3,157	..
	Fiji	12	...
	France	706	...
	Turkey	2,978	...
	United Kingdom	252	...
	United States ..	39,718	...
Preserved in liquid—			
Apricots ..	....	...	341,881
Peaches ...	....	...	341,081
Pears ..	....	...	4,565
Pineapples ...	....	...	679
Raspberries	....	...	3,896
Other ...	....	...	32,683

Sidelights on Organising Herd-testing Units.

C. S. KENTWELL, H.D.A., H.D.D., Dairy Instructor.

THE Dairy Branch of the Department of Agriculture has for some years not only been effecting the formation of grade herd-testing units, but it has also been controlling their operations. This particular work is important as enabling the industry in this State to develop equally with that of other countries, and if possible, even better than equally.

Herd-testing is really the only sure way by which a farmer can systematically raise the average production of his herd, for if he depends on his own observations in culling and breeding, he will more than likely cull cattle of greater value than he thinks, and he will be keeping calves from cows not as good as he believes them to be. On these lines the milk yields of his herd will be on a downward rather than an upward course. With the help of herd-testing a farmer has definite data which is of the greatest importance in building up a herd on lines of greater production.

One farmer with whom an officer of the Dairy Branch has become acquainted has had his herd tested for three seasons, and has now commenced his fourth season. The result of his first year's testing showed that his herd of forty-seven cows produced an average of 150 lb. of butter-fat per head for the twelve months. After testing and culling for two more seasons his herd averaged 186.75 lb. of butter-fat per cow for the twelve months ended 30th September, 1926. This farmer's present aim is to breed, feed, test, and cull so that he can obtain an average of at least 250 lb. of butter-fat per annum from each cow on his farm. When that is accomplished, he will strive for still a higher production of milk and fat per cow.

Numerous instances can be quoted where farmers have found that, after testing and culling out the low producers, they have obtained as great an aggregate yield from forty cows as from the milking herd of the fifty untested, unculled, and poorly fed cows that comprised the herd a few years before. This is only what is expected, for good cows respond to attention and better feeding by giving increased yields of milk and butter-fat.

One farmer found, through testing, that he was able to reduce his herd by fifteen, and still receive the same cheque from the factory with butter at the same price, at the same time reducing his labour cost by dispensing with one man.

There are a number of herd-testing units in this State, but there should be many more. A large percentage of the farmers do not yet seem to realise that it is to their own personal and individual advantage to have their herds tested.

The Evasive Answer.

Many excuses are put forward by farmers for not having their cows tested. These excuses cannot be dignified as arguments or reasons—they are palpably only evasions—side-stepping of a reform that is known to be needed.

One farmer would not have his cattle tested because he could pick his good cows from the bad ones for himself. When asked how he could do it, he told the organiser that he took samples of each cow's milk and stood them in bottles and watched the cream rise. This man was milking a herd of over sixty cows. Although it was explained to him that even the amount of cream that rose to the top was not always a true indication of the richness of the cow's milk, as the cream from some cows would not rise as rapidly as others, and then even the cream varied in richness, he still was of the opinion that he could thus pick them. As a matter of fact, he probably never took milk samples for such a purpose.

Another man on a river farm valued at £70 per acre, every inch of which was cultivable, would not have his herd tested because he stated he was giving up dairying and was going to rear and fatten bullocks on his farm. Another would not test last year because he was going to sell out shortly. Both these men are still on the same farms, and still have the same excuses.

Still another would not test because if he did, the testing might reveal that he had some "dud" cows and the Department would get to know it, and as he could not afford to cull them out he would be classed as a very poor type of farmer! Although considerable time was spent in presenting the work in its true light to this man he adheres to his excuse.

The same man's next door neighbour would not test because, "If Mr. X would not take it on, then he would not, because Mr. X knew more about farming then he did; and if he said 'No,' then there must be something wrong with the scheme!"

The organiser is sometimes told by the farm occupant that he is a greater nuisance than an over-persistent agent or hawker, and often he comes back to his headquarters wondering whether it is true that he has been trying to advocate something that will really assist the farmer to improve his herd and increase his cream cheque, or whether by any chance he has been dreaming and his "goods" are in reality inferior and not what he represents them to be.

Perhaps some day in the not far distant future there will come a time when it will be recognised as necessary for all farmers to have their herds tested. When that day comes, there will be a good many wondering why they did not start testing long before.

The best doctor for your pigs, and also other livestock, is old Dr. Sanitation. If plenty of good food of the proper kind is fed, and plenty of clean water given, seasoned with a liberal amount of common-sense and cleanliness, then the disease germs will not get a start.—*Farmers' Advocate* (South Africa).

Soybeans—A New Farm Crop.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

In soybeans Australia may be said to be on the verge of discovering what should prove, for many districts, a valuable farm crop. Soybeans were introduced and tried out, chiefly on the coast, several years ago, but were discarded as having no special merit. Further introductions (from America and elsewhere) were made more recently, however, and the crop was tested in some of the tableland districts with much more encouraging results. It was found also that whereas most varieties of soybeans did not make very good growth on the coast, there were a few late maturing varieties of recent introduction which gave excellent promise. Hence the necessity for some statement of New South Wales experience and the local possibilities of the crop.

With regard to the latter, the experience of the United States cannot be ignored. The area there under soybeans ten years ago was quite a modest one for that country, being about 100,000 acres, but it is estimated that the area is now over 2,000,000 acres. In one State alone, Ohio, the acreage in 1916 was 4,921, and this had increased by 1923 to 128,000, an increase of twenty-six fold in seven years. According to Circular 84 of the Iowa Agricultural Experiment Station the many uses of the crop on Iowa farms, the ease and certainty with which it may be grown, and the profits derived from its production account for the fact that the soybean acreage in Iowa is more than doubling each year.

In Illinois the acreage of soybeans was 30,000 in 1918, but this had increased to 650,000 in 1923. Whereas formerly they were grown as a substitute crop when clover or some other crop failed, they are now regularly grown for hay, grain, hogging or sheeping off, or with maize for silage. Australia has so many districts with climate similar to that of those parts of America where soybeans are making such headway that it is only reasonable to expect that they would be found suited to many parts here. The growing of soybeans in New South Wales has so far been restricted to a few experiment farms and a handful of farmers in scattered districts, but the utility of the crop is evident from these tests. The good growth made under a wide range of conditions, the high protein value, the palatability of the forage, and the beneficial effect on soil fertility should result in the rapid extension of the area sown to it once local farmers have given it a proper trial.

Climate and Soil.

Soybeans are an annual warm weather leguminous crop and are sensitive to frost. They therefore cannot be sown in any district until all danger of frost is over, and they should reach their desired development, whether

they are being sown for green fodder or for seed, before the occurrence of autumn frosts. Varieties differ greatly in maturing period and growth, and care must be exercised in their selection according to district and time of planting to secure the best results. Soybeans may be classed as a very drought-resistant crop in tableland or coastal districts, but do not withstand the more extreme summer conditions of the western slopes or plains unless on alluvial or deep soils which hold moisture well.

Although the best growth of soybeans will be obtained on the most fertile soils, they thrive under conditions which are unfavourable to many other crops, and on some poor soils, especially if assisted with an application of superphosphate. The crop is not over particular with regard to the physical nature of the soil. Although it grows better on light soils than on the heavier clay soils, especially in the tableland districts, it will succeed on the latter soils, and has done well in low situations, where other crops have suffered from too much moisture, once it has got a good start.

Soybeans for Hay.

It is chiefly as a hay crop that soybeans are grown in the colder states of America. These states have their counterpart in our tableland districts. On sandy soils in many of the northern states of America soybeans are of great and increasing importance as a source of legume hay for stock feeding, and even on heavier soils soybeans are largely grown as an emergency hay crop on land where clover fails. Soybean hay can be successfully grown on soils deficient in lime and so acid that the common clovers cannot be grown with success, if at all.

Clover has not entered into our tableland farming practice in New South Wales, principally because of lack of knowledge concerning its many merits, but partly because of its failure in some years owing to dry weather. In such years, or when the planting of the usual oaten hay crop is delayed too long, soybeans may well occupy part of the land as an emergency hay or summer fodder crop for farm use.

The making of hay from soybeans in the autumn comes at a comparatively slack time on the farm, a decided advantage from the standpoint of labour distribution.

The following table, compiled from "Feeds and Feeding" (Henry and Morrison), shows the percentage of digestible nutrients in soybean hay and other hays:—

	Digestible Crude Protein.	Digestible Carbo-hydrates.	Digestible Fat.	Total Digestible Nutrient.
	per cent.	per cent.	per cent.	per cent.
Soybean hay	11·7	39·2	1·2	53·6
Lucerne hay	10·6	39·0	0·9	51·6
Red Clover hay	7·6	39·3	1·8	50·9
Oaten hay	4·5	38·1	1·7	46·4

Yields of 1 to 3 tons of soybean hay per acre, according to the rainfall, soil, and temperature, are stated to be not uncommon in America, and some local experimental crops have been estimated to yield well up to 3 tons of hay. When it is realised how much superior soybean hay is to oaten hay and how favourably it can compare with lucerne hay from a feeding standpoint, soybeans will doubtless be grown in certain circumstances in suitable districts to replace part of the area under these crops. There is nothing so much required by dairy cattle generally throughout many of our districts as foodstuffs containing a higher percentage of protein. Feeding trials carried out at the Wisconsin Agricultural Experiment Station to

Soybean Plants.
Showing the development of nodules thirty days after planting.
[From *Bulletin No. 96, Delaware College Agricultural Experiment Station, U.S.A.*

compare the feeding value of soybeans and lucerne hay for dairy cows have proved that soybean hay is worth only slightly less than lucerne hay, which stands unexcelled for stock feeding. There is usually more waste in feeding soybean hay than lucerne hay, due to the stems being woody and coarser. In these trials 17 to 18 per cent. of the soybean hay was refused by the cows, while the lucerne hay was consumed practically without waste. Horses do not generally waste so much of the stemmy part of soybean hay. Further experiments carried out by the Wisconsin station have shown the high value

of legume hay for pigs when no pasture is available. Soybean hay has also been found to be a satisfactory roughage for sheep, especially for breeding ewes.

Soybeans as a Supplementary Crop in Maize.

Place should also be found for soybeans as a supplementary crop in maize, particularly where the maize crop is utilised at any stage for feeding to stock, or where the field is utilised for grazing after harvest.

In some parts of the State, it is a common practice to turn sheep or lambs into the maize crop at the cobbing stage, when quite a lot of useful feed, such as the lower leaves of the maize plant and weed growth which has sprung up since the last cultivation, is available. Where this is the practice, it is a good idea to sow some soybeans at the same time as the maize and in the same rows, so as to have some better and more nutritious and balanced feed available. Growing lambs particularly need a class of feed which contains more proteins or flesh forming ingredients than weeds and maize leaves can supply, and there does not seem to be any crop as good in this respect and as successful when sown in a maize crop in this way. The practice referred to is most common on the Murrumbidgee River flats and on the Northern Tableland, and it is there that soybeans for this purpose are well worth trial. This is particularly the case when a somewhat thin stand of maize has been obtained. It never pays to fill up such a stand with maize, for this later sowing never does any good, but soybeans hoed into the thin spots in the rows as soon as the thinness is apparent make excellent growth and fill a very useful role. It may even be advisable to seed maize purposely a little lighter than usual and to increase the seeding of soybeans. This is particularly so on poor land, which does not yield heavily, and which it is desired to improve, and at the same time utilise for the cash crop. Much granite, ironstone, or poor or volcanic soil on which maize is at present grown on the Northern Tableland with poor results would be the better for being utilised as described.

Soybeans do not come again after grazing, so they should always be sown early in a maize crop in order to make the best possible growth.

On the North Coast, cowpeas are often sown at the last cultivation of an early sown maize crop for green manuring or for ploughing in when stock have grazed to some extent on the land after harvest, and it is not yet known how far soybeans are likely to replace cowpeas for this purpose. It is certain, however, that only late, good fodder-producing varieties of soybeans like Otootan or Biloxi will be of any use here. Soybeans are much more palatable to stock than cowpeas, but they may not smother weeds so well, and it is probably only where it is desired to make use of part of the growth for feed that soybeans would be preferable to cowpeas.

In America, soybeans are largely used in combination with maize for silage, it being claimed that the silage produced by the combination crop has a much higher feeding value than maize silage alone. So far this combination has not been tried in New South Wales, but if the crop grows

well in such an association it may come into use in this way. In such case the combination silage, with its higher protein content, should mean a saving on bought concentrates. Some farmers in America plant maize and soybeans in separate fields with better results, and mix the two when filling the silo.

Soybeans sown with maize for hogging off the combined crop is also a favourite practice in America, and the soybeans are certainly worth inclusion with maize in this country.

Soybeans for Seed.

With such a large area under soybeans, a large amount of seed is naturally produced in America, and this has proved its value and is becoming popular as a concentrated feed for all classes of stock. The following table* shows the percentage of digestible nutrients in soybean seed and in soybean oil meal in comparison with other concentrates commonly used in stock feeding in New South Wales:—

	Digestible Crude Protein.	Digestible Carbo-hydrates	Digestible Fat.	Total Digestible Nutrients.
	per cent.	per cent.	per cent.	per cent.
Soybean seed	33·2	24·7	16·1	94·1
Soybean oil meal	39·7	34·7	4·5	84·5
Linseed meal	30·2	32·6	6·7	77·9
Bran	12·5	41·6	3·0	60·9

* Compiled from "Feeds and Feeding" (Henry and Morrison).

It is stated, however, that soybeans fed in excess to dairy cows change the character of the butterfat, so that a very soft butter is produced. For this reason they should not be fed at more than 2 lb. per head daily. Tankage is largely used and highly valued in America as a protein-rich concentrate for pigs, and trials have shown that soybeans are not far behind it for this purpose.

Soybean seed is a highly nutritious protein-rich concentrate, and if it were largely produced locally might be utilised as a sheep feed during drought and also for finishing lambs for market.

Mills have been established for some time in America for extracting the oil from soybeans. It is imported to Australia and used extensively in commercial ways. The by-product of these mills, soybean oil meal, is used for feeding all classes of stock and poultry.

Place of Soybeans in Crop Rotation.

Leguminous crops are valuable alike in maintaining (or increasing) soil fertility and in providing stock with food of high protein value, and where soybeans do well farmers should endeavour to fit them into the regular cropping system on the farm. It is chiefly in the tableland districts where oats, wheat, maize and potatoes are grown that soybeans will be found to

fit best into a rotation. In America soybeans are largely grown once in four years in rotation with two crops of wheat or oats and one crop of maize, and also largely as an emergency hay crop when clover sown with the small grain crop fails, and a similar place for soybeans is possible in many tableland parts of New South Wales.

Mr. J. S. R. Crawford, Emu Swamp, Orange, who has probably had more experience with soybeans than any other farmer in this State, having grown this crop first in 1914, states:

"Our idea with regard to fallowing for wheat or oats in this district is that by having a suitable rotation we can dispense with fallowing, get a crop every year of some sort, and at the same time build up the soil, much of which is poor white pipeclay. We aim at putting in Perennial Red clover with the wheat, harvesting with the reaper thresher and leaving the straw standing. In grazing the clover, the straw is beaten down and decays. It may be left under clover one, two, or three years, and is then ploughed up for corn. We find it necessary to plough for corn in time to store the winter rains. Our summers are frequently dry, and we never get more than 33 bushels of maize per acre, and often much less. Sometimes we are not able to get the corn harvested till June. It is too late then to have the paddock ploughed for wheat or oats. We therefore want a summer crop, a legume if possible, that we can harvest before ploughing for wheat. This is where soybeans are valuable. We either cut for hay or graze down. Sheep graze the crop right to the ground. They are very keen on it, and we have found this is also the case with horses and cattle.* We are pleased with the way soybeans stand a dry time."

Further particulars regarding the culture of this crop are given in a leaflet published by the Department of Agriculture.

* Rabbits are also extremely fond of soybeans, and areas of this crop require protection from them.—H.W.

"Agricultural Surveying."

Under the title "Agricultural Surveying, including Mensuration, Road Construction, and Drainage," over 300 pages present an attempt to provide an elementary text-book on surveying, with what may be termed an agricultural "bias." The principles of mensuration and surveying are dealt with, levelling and drainage for irrigation are discussed, and road construction and ordinary drainage problems are introduced as likely to be of value. The book is written primarily for the agricultural student, and a number of typical examination questions are given which are likely to be helpful in the study of the subjects. The author is John Malcolm, B.Sc., Lecturer in Agricultural Engineering and Surveying, West of Scotland Agricultural College.

The book is published by the University Tutorial Press, Limited, London, from whom comes our copy.

Growing Green Peas.

A. J. PINN, H.D.A., Special Agricultural Instructor.

It is not many years since green peas were looked upon as a luxury, but now this vegetable is classed with those of almost everyday use, as it is possible to secure supplies practically throughout the year at prices within the reach of all.

Requires a Temperate Climate.

Although the pea crop requires for its best development a temperate climate, the range of conditions in New South Wales is such that the crop can be harvested in one part or another of the State during every month of the year. In the cooler portions of the State the season of growth is during the summer months—a period when the cultivation of the crop is limited in other districts owing to the heat While the plant itself is seldom injured by frost, the flowers and pods are not so hardy. Young pods that have been frosted and that are unlikely to develop may be distinguished by a characteristic white mottled appearance on the outside skin. During autumn and spring, when frosts are sufficiently severe to cause damage to the crop in cool, elevated districts, the conditions are then suitable for its growth in warmer districts, while in the frost-free regions bordering on the sea the crop can be harvested in midwinter.

It is largely a matter of experience of local conditions and, to a certain extent, luck in missing damaging frosts at flowering which regulate the range in planting dates from the early to the late sowing crop.

The damage from frost may be only partial, and a later crop of bloom on plants previously "nipped" may form up without further trouble.

Growing for Seed when Market is Glutted.

There has been a considerable increase in the area planted of late years, so much so that gluts are not infrequent. This is due largely to the high monetary returns which are at times secured during crop shortages inducing greater interest in the crop in following years. It is always impossible to foretell what the season will be, and as the crop is one largely grown without irrigation fluctuations will always occur.

During periods of glut many consignments realise less than the picking and forwarding costs, and are then a direct loss to the growers. Under these circumstances it would be advisable for growers to consider the question of maturing the crop for seed. If this were done a good deal of expense of future crops would be saved, and, apart from supplying one's own requirements, there should be little difficulty in disposing of further supplies should the quality be satisfactory. While the growing of seed for the market demands that care should be exercised in eliminating strangers, &c., it has been proved that seed grown in this State is equally as good as

that produced in other States. As the supply of pea seed is now almost wholly imported, it is in the interests of the State and producers generally that greater attention be given to this aspect of the pea-growing industry. The possibilities in this direction should certainly not be lost sight of during periods of glut, particularly in the tableland districts, where very large areas are at times under cultivation.

A Good Soil Improver.

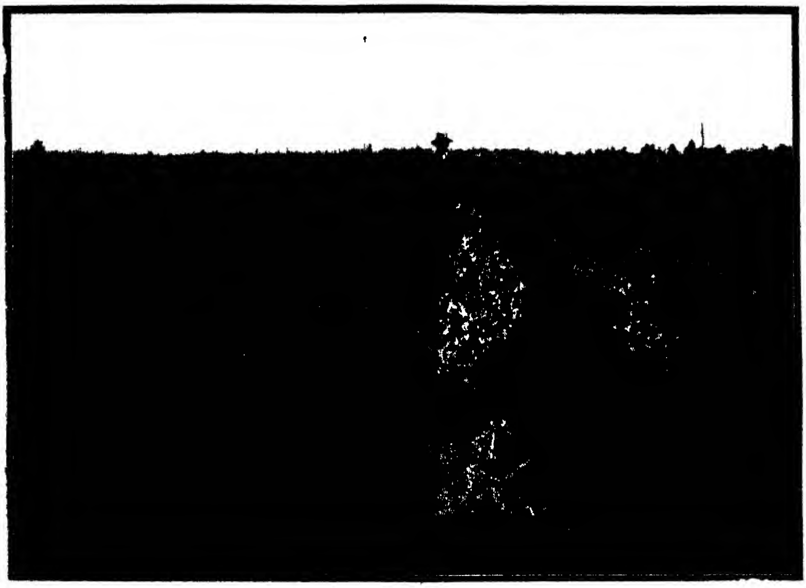
A sandy loam is most suitable for the crop, but almost any soil of fair average quality will yield good results. As with all legumes, the supply of nitrogen in the soil is matter of less moment than that of phosphoric acid, potash and lime, and hence it is that in some localities dressings of fertilisers that contain the last three have a material effect upon the yield. The crop has the strong recommendation that, in addition to yielding profitably, it contributes to the fertility of the soil for the purpose of subsequent crops by increasing the store of nitrogen, and by enabling the gardener or farmer to add to the soil a considerable quantity of top-growth of a kind that humifies readily when turned under. It does well on newly broken land, and can be used as a preparation crop.

Sowing and Cultivation.

The water requirements of a crop of peas are considerable, and the preparation of the soil should be commenced early enough to enable a supply of moisture to be stored. The land should be cultivated as required to conserve all rain that falls, to destroy weeds, and to produce a good tilth in which the roots will find favourable conditions. Every endeavour should be made to induce germination of weed seeds before the crop is planted. If this is done the subsequent cleaning of the crop will be much easier. During the picking season there is often little time to attend to destroying weeds, hence the necessity for thorough cultivation during soil preparation and early stages of growth. A good strike of weed seeds can usually be controlled by harrowing, which is so much quicker than inter-cultivation work, which would be necessary once the crop is planted.

The sowing of seed by seed drills is not favoured by many growers, as the seed is sown in a narrow drill only one seed wide, resulting in a crop which is almost sure to lie over at a very early stage of development. It is much the more common practice to open up shallow drills, drop the seed by hand, and cover to a depth of about 2 inches by means of a harrow, light cultivator, or hand hoe. When sown by hand in open drills the rows are wider and greater support is given by one pea plant to another, and hence the crop stands up better than when sown by drill. In sowing it is a good plan to plant the rows at a distance of 6 to 9 inches apart, dropping the seeds 2 to 3 inches apart in the rows, a space of 2 feet 6 inches to 2 feet 9 inches being left between every pair of rows. This system of planting assists the plants in maintaining themselves in the soil. About 1 bushel to 1 bushel 1 peck of seed is the usual rate of seeding per acre

The seed should only be covered to a shallow depth, but in hot months it may be necessary to make sowing drills deeper in order that the seed be planted in a moist layer of earth. When this is done greater care will need to be exercised in covering. Seed so planted is then at a disadvantage should rain or thunder storms occur, as water quickly lodges in the drill depressions, and more than likely a poor germination results. Pea seed often fails to germinate when heavy rain falls after sowing, and for that



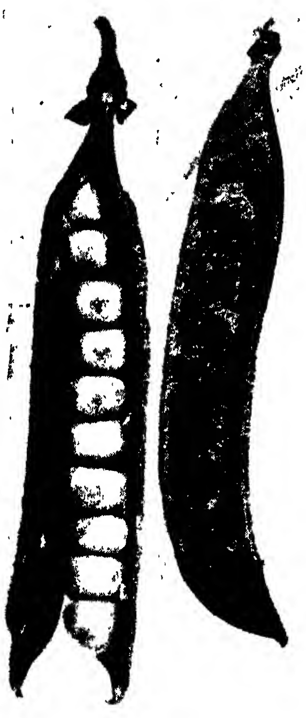
Crop of Greenfeast Peas.
A Favourite Variety for Growing in the Field

reason once the seed has been sown it is always the aim of the grower to obtain germination before applying water. In coastal districts in frost-free situations planting may be made from March to October The Christmas market can be catered for by planting the first week in October. On the tablelands plantings are made from September to a time—usually December or early January—likely to catch the Easter market. Plantings are made later, but risk of frost is great.

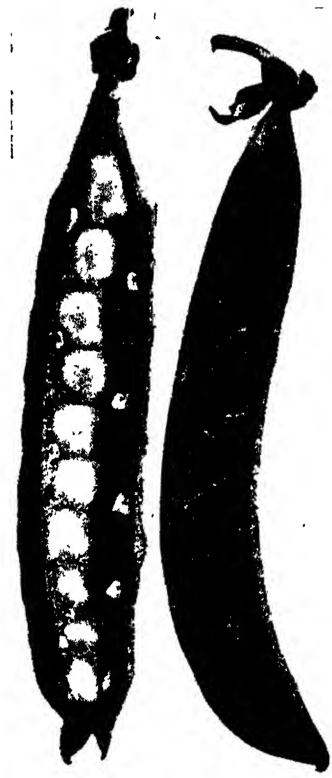
Fertilisers.

In practically all districts of the State the application of superphosphate results in increased yields, and the usual application recommended is from 1 to 2 cwt. per acre. Heavier dressings than these have come under notice, and even as much as 5 cwt. per acre has been profitably employed. Such heavy applications, however, are not recommended, especially where the grower is dependent on natural rainfall for the moisture supply. A mixture of bonedust and superphosphate in equal quantities, at the rate of

1 to 2 cwt. per acre, has also given good results in many districts, but of late years the use of basic superphosphate has given results which justify growers testing this fertiliser with the crop. Basic superphosphate may be prepared on the farm by mixing with each 100 lb. of superphosphate 17 lb. of air-slaked lime.



Richard Seddon.



Greenfeast.

Yields.

Yields of from 60 to 80 bushels are fairly general, while even 100 to 200 bushels are also common. Under particularly suitable conditions 4 tons of green peas (320 bushels) is not looked upon as extraordinary. One grower in the Ben Lomond district repeatedly secures yields as high as this.

Harvesting and Marketing.

Pods should be picked as soon as the pea kernels are full and give the pod a tight feel, but before any loss of colour occurs, such as is the case when on the turn to maturity. Twenty-eight pounds of green peas is the

usual trade recognition of a bushel weight. Growers sending their peas long distances must always allow for loss by shrinkage in transit, and in some cases it is usual to reckon on a 2 lb. loss per bushel.

If the peas have to be stored on the farm overnight or for any time before despatch it is advisable that they be spread out on the floor of a shed rather than left in bags. Sweating in heaps in the shed will not be harmful to the same extent as would be the case in bags, particularly when done up in full chaff bags. The usual method of marketing is in small bags—about 2 bushels in size—which are made by the grower or supplied by the agent who is to dispose of them.

For local markets it is often an advantage to do up in small lots of 7 lb., more or less, in order to cater for family supplies.

Picking costs vary with the crop. The usual price is somewhere about 1s. 6d. per bushel, but with high yields it may be possible to secure pickers at a lower price. When the yield is low the price increases proportionately, and under these conditions it is only possible for the grower to bear such an expense when market prices are high.

A careful watch should be kept on the pickers to see that only the full pods are harvested. Immature and discoloured pods should be eliminated from any consignments marketed.

Varieties.

For field areas cultivation is restricted to dwarf types, but in home gardens, where it is desirable to curtail the area, good use can be made of the tall growing sorts, which should be supported by small dry limbs of trees or on netting or trellis. One of the best varieties for this culture is Duke of Albany.

The variety favoured for field culture is Greenfeast, and most commercial growers are now well acquainted with its merits It is a large-podded variety, with a curved end, usually containing about nine peas. It is a favourite on the market, being sold, as with some other varieties, under the trade name of Wonders. One of the advantages of this pea is that it retains its colouring during transit, whereas some of the varieties previously cultivated were inclined to become rather pale, which is a bad feature in the marketing.

Other varieties which also find favour, as Richard Seddon and Witham Wonder, both large-podded sorts, are also sold under the trade name of Wonders.

Richard Seddon is favoured by many growers in the county of Cumberland for growing for the autumn crop, as it is the general impression that they will pod better in cooler weather than most other varieties.

The old popular favourite, Yorkshire Hero, is yearly becoming less popular owing to the small size of its pods in comparison with other varieties previously mentioned. It is, however, a fairly hardy sort, and can generally be relied upon to crop well.

Cutworms.

Cutworms at times cause considerable damage to pea plants. These caterpillars feed at night or dusk, or on cloudy days, and during the young stages of growth may "cut off" quite a large percentage of the top growth of the crop. During the day time they shelter in loose soil or dead leaves, but can usually be dug up from the soil a few inches from the base of plants which have been attacked. The caterpillars make their first appearance during August or September.

Poison bait appears to be the most effective method of dealing with the pest. This bait is made by mixing 1 lb. paris green, 24 lb. bran, 3 oz. salt, and 3 quarts of water. This bait, when mixed, makes a crumbly mash, which is scattered along the base of the rows at the rate of 50 to 75 lb. per acre. Molasses may be used instead of salt, the idea being to enable the mixture to retain its moist condition. The treatment may have to be repeated at short intervals, and it is not wise to mix up more than is required for the one application. In order to keep the bait moist it is advisable not to mix and apply until late in the afternoon.

Importance of System in Herd-testing.

It has been argued by some farmers that they can test their herds themselves without joining a herd-testing association. This is certainly true, but how many farmers, even though they have purchased the necessary outfit, carry the work to a successful issue? It is found in almost all cases that the machine has been used once or twice and then left to rust, or a few cows have been tested to-day, and a few tomorrow, and so on. Unless testing is done systematically and efficiently, the information gained is useless. All cows must be tested under the same weather and feeding conditions to ascertain their relative values.

Test records indicate the value of the bull used by comparing the records of the dam and progeny, and serve as a guide in selecting the cows that are the best yielders—not over a month or two, but over the whole year—the ones one would like to keep a heifer from. It picks out the drone that should be culled out at once, or as soon as there is a better animal to replace it.—A. C. Small, Senior Dairy Instructor.

Cover Crops with Lucerne.

Owing to the slow growth of lucerne during the first year, many farmers are tempted to sow it with another crop, such as wheat or oats, from which some return may be obtained. Others think that the sowing of such crops will assist the young lucerne by giving it some cover. This is not a sound practice. The young lucerne plant is slow in growing, while the wheat, oats, or barley, &c., are vigorous growers, which take from the soil moisture and plant food and soon rob the young lucerne plants, which, instead of growing sturdily, become stunted and weak, and are not in condition to stand the hot weather conditions when the cover crop is taken off. Careful preparation of the soil is required for lucerne, and this, with the cost of the seed, represents a good deal of expenditure, and it is not worth while risking the loss of this for the comparatively small return obtained from the cover crop.

"Cyaniding" Fruit Trees.

THE EFFICIENCY OF OUR SYSTEM.

A. A. RAMSAY, Chief Chemist.

As early as 1886 it was noted that hydrocyanic acid gas was an efficient insecticide for scale insect pests on citrus trees, and in 1890 it was employed quite extensively in a commercial way. Its subsequent development and use, though retarded by the war, has been steady, and to-day fumigation of citrus trees is carried on extensively wherever citrus fruit is grown.

When first used the hydrocyanic acid was produced from the interaction of potassium cyanide and sulphuric acid, and the liberated gas was allowed to diffuse under a canvas tent covering the citrus tree, and to act on the scale insects for a definite time. This method was known as the "pot" system. Latterly, the system known as "dust fumigation" has been extensively adopted in citrus districts.

Within the last few years liquid hydrocyanic acid has been manufactured in America for fumigation purposes, and it is claimed that better results are obtained by means of it, but it must be pointed out that special storage buildings or sheds are necessary, that the waggons used for transportation require to be specially constructed and insulated, and that a certain amount of difficulty is experienced in keeping the liquid hydrocyanic acid without deterioration. More recently still, a pure calcium cyanide has been prepared and is being sold in America for fumigation under the name of "solid hydrocyanic acid," but this production is of so recent a date that sufficient time has not passed to permit of its qualities being tested out in extensive field trials.

When, and as used many years ago, potassium cyanide of about 98 per cent. purity was the cyanogen compound from which the gas was prepared (this compound being also used extensively in the extraction of gold), a sodium salt was used in the manufacture to more or less replace the potassium salt, with a view to cheapening the commodity, with the result that a sodium cyanide or a mixture of sodium and potassium cyanide was produced. As the users had been accustomed to the name "potassium cyanide," the newer and cheaper product was still sold under the old name, and the cyanogen content was expressed in terms of potassium cyanide. A grade corresponding to 98 per cent. potassium cyanide is the one principally made, but a sodium cyanide nearly pure may be purchased. The grade corresponding to 98 per cent. potassium cyanide contains sodium chloride (common salt) as an impurity, whereas the nearly pure sodium cyanide contains little or no chloride.

Though the "pot" method of fumigation has been successfully used here, in America, and in Egypt, it has been suggested that the method is wasteful—that only a portion of the total hydrocyanic acid is given off

in this method, the inference being that the method, as applied, leaves a lot to be desired. To ascertain what losses occur, or whether (as contended by one writer) in the "pot" system "more than half the cyanide is lost," investigations have been carried out in the Chemists' Branch of the Department of Agriculture, the results of which are considered to be of special importance to citrus fruit growers.

In the first series of experiments, the evolution of the gas was allowed to take place in a flask, and the gas evolved was caught in suitable absorption vessels. The composition of that portion which had been evolved and of the portion remaining in the flask was determined, so that these might be correlated with a second series of experiments imitative of the "pot" method as used in field practice, the quantities of cyanide and sulphuric acid used corresponding to those recommended by the Department.

The inclusion of the whole of the figures obtained as a result of our investigations would make this article too lengthy, consequently only the more important data will be given here. The cyanide used had the following composition:—Hydrocyanic acid (HCN), 40.36 per cent, chlorine, 6.82 per cent.

In eight trials, nearly the whole of the hydrocyanic acid was given off —the hydrocyanic acid remaining in the pot ranging from .05 to .02 per cent. of the total hydrocyanic acid present in the sample. Leakages and losses may occur in field operations, but there is every reason to believe that at least 95 to 98 per cent. of the hydrocyanic acid in the cyanide used would be available.

As regards the chlorine present as an impurity in the sample, the experiments showed that in five trials only 2.9 to 6.3 per cent. of the total chlorine present in sample was evolved as hydrochloric acid—the mean of the series being 4·5 per cent., so that 95·5 per cent. of the total chlorine present in the sample remained unattacked.

It is suggested that the sulphuric acid reacts with the cyanide first, and after this reaction is complete any remaining sulphuric acid then reacts with the sodium chloride, but at this stage the amount and concentration of the sulphuric acid is so small that only a very small portion of the sodium chloride is decomposed.

It is difficult to state definitely whether this small amount of hydrochloric acid gas present with the hydrocyanic acid gas would be injurious to foliage, but as cyanide as at present manufactured has been successfully used in this State without producing ill effects, it appears reasonable to suggest that the small amount usually present is not sufficient to cause injury. This question could best be settled by comparative trials in the field, with a relatively pure sodium cyanide as against the usual grade, *i.e.*, one containing cyanogen equivalent to 98 per cent. potassium cyanide.

The chemical composition of cyanides imported into this State will be dealt with in a subsequent article.

Commonwealth Citrus Research Station.

First Field Day at Griffith.

The Commonwealth Citrus Research Station at Griffith conducted a "Field Day" on 29th September, with the object of acquainting settlers on the Murrumbidgee Irrigation Areas and visitors with the work that is in progress there. The response on the part of the public was an evidence of a general and real interest in the experiments and demonstration work, and a large and representative company was taken round the field plots and laboratories by Mr. E. S. West, the officer-in-charge.

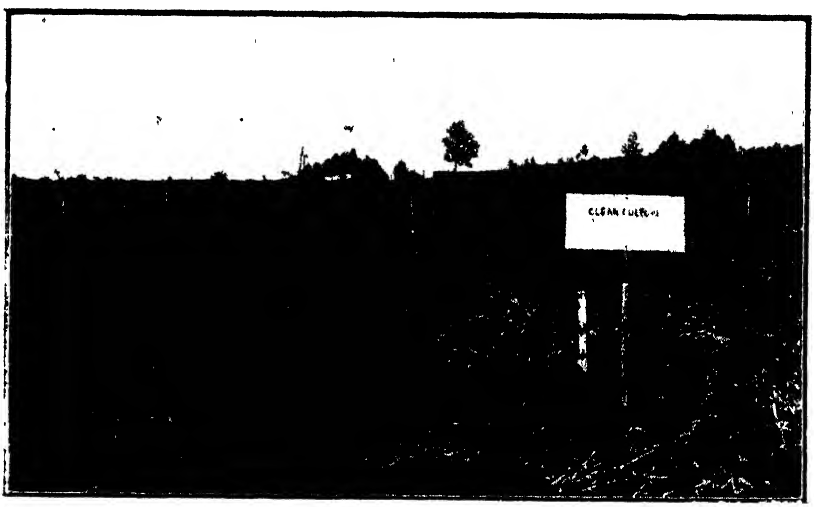
One of the most important factors in the successful management of the soil under irrigation, especially in horticultural practices, is the building up and replenishment of the organic matter in the soil, for in arid districts the chief requirement of the soil is humus. The question of green manuring, however, is beset with several problems. There are advantages and disadvantages in the use of either summer, winter, or other types of green manure. Summer crops, although usually adding more to the soil than winter crops, compete with the main crop during its growing period, and necessitate the greater use of irrigation water. Winter crops are not so easily grown as summer crops, but they do not compete very seriously with the fruit trees. Such crops as Bokhara clover and lucerne are particularly difficult to handle, and compete very seriously with the fruit trees, but are of great value in opening up heavy subsoils and supplying a very large amount of organic matter to the soil.

A number of different methods of green manuring are under trial at the station, and it is expected to find marked differences in the effects of these treatments on the mechanical, physical, and biological conditions of the soil, while certain physiological effects on the growing trees may also be looked for. Already it is noticed that the soil of plots treated with summer green crops (cowpeas) is markedly more fertile than that of the clean culture plots, as evidenced by the luxuriant growth of weeds thereon, the improved physical condition of the soil, and the growth of the trees. (See accompanying illustrations.)

One very important effect of increasing the organic supply is to improve the structure of the fine sandy soils common on the area. Such soils run together and set very hard after rain, making cultivation difficult, and the only means of properly correcting this appears to be by building up the organic supply.

On the field devoted to a phosphatic fertiliser experiment with lucerne, the plots receive dressings of 1 ton of rock phosphate per acre (initial dressing only) and varying quantities up to 4 cwt. of superphosphate per acre annually. The visitors were impressed with the effect of the phosphatic fertilisers, especially of the superphosphate, on the growth of the lucerne when compared with the unmanured plots.

The results already obtained on parts of the irrigation area from applications of gypsum have been most important, and the comprehensive series of field experiments being conducted at the station where plots receive dressings varying from ½ to 4 tons of both gypsum and lime per acre will be of permanent value. Plots ploughed to a depth of 24 inches (sod turned), and subsoiled to a similar depth (sod not turned), are also included, and each treatment is carried out in conjunction with and without tile draining. The tiles are laid to a depth of 4 feet for the most part, but for comparative purposes one line is laid to a depth of 3 feet, and one to a depth of 2 feet. In most cases the drains are placed 66 feet apart. The effect of the gypsum was seen to be to flocculate the soil, increasing its permeability and ease of working. This effect is also noticeable, but to a much lesser extent, on the limed plots. The deep ploughing apparently is the most lasting of the treatments, and has every indication of being permanent. Permeability is very greatly increased on these plots; the soil absorbs more rain and irrigation water, and remains damp at the surface for a much longer period than on the untreated plots.



A Clean Culture Plot in Green Manuring Trial.
Compare the weed growth on this plot with that on the opposite page.

The drains are not only preventing the development of salt patches, but are actually reclaiming land already salt-impregnated. Where the soil is disturbed to a great depth, as in grubbing out large trees or by rabbits, the soil is rendered more permeable and has a greater capillarity, and in such isolated spots salt is liable to accumulate at the surface.

Great interest was taken in the tile drains, as this is the first system to be installed on the Murrumbidgee Irrigation Areas, but tile drainage will undoubtedly be resorted to by many on these areas in order to increase the productivity of the land.

A series of fertiliser trials has been commenced to determine the type of fertilising ingredients that needs to be applied in order to obtain the best results. Plots receiving complete fertilisers (including nitrogen, potash, and phosphoric acid), plots receiving a complete fertiliser minus one ingredient, and plots receiving one fertilising ingredient only were compared, together with unfertilised plots. There are thus plots receiving eight different treatments.

Great interest was taken in the bud selection work in progress. In order to improve the type of oranges and obtain high-yielding strains, buds have been selected from picked trees on the Murrumbidgee Irrigation Areas, the coastal districts of New South Wales, the Murray River settlements, and other localities, and from these buds trees have been raised and have been planted on the Research Station. In this way it will be possible to com-

The Cowpeas Plot in a Green Manuring Trial.
Note the weed growth as evidence of fertility compared with the clean culture plot.

pare the yielding capacity of the strains so selected under identical soil and other environmental conditions. Trials are also being conducted as to the most suitable stocks for citrus.

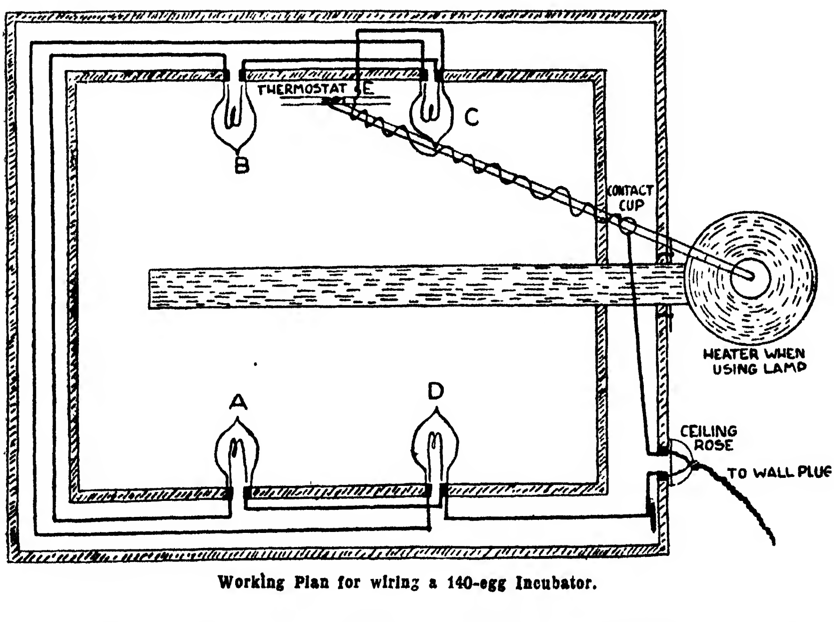
In the Laboratory, methods of analysing the soil and other laboratory processes were demonstrated. Much interest was taken in a chart showing the variation in the sugar and acid content of the juice of oranges during the process of ripening.

The mass of research work that is going on at the station—more extensive and complex than the above sketch would even suggest—was a surprise and pleasure to the visitors, and many testimonies were heard to its usefulness. "Field Day" assuredly increased confidence in the results that are being obtained, and stimulated hopefulness that other problems would come under investigation.

The Electrification of Kerosene-heated Incubators.

C. LAWRENCE, Poultry Instructor, Hawkesbury Agricultural College.

POULTRY-KEEPERS, having in view reduction of the cost of production, are coming to realize more fully each year the value of efficient appliances, designed to save labour and simplify the work of the farm. As the heating element in incubators, electricity is more in keeping with modern times than kerosene lamps, for it entirely eliminates the necessity for the constant care and attention which the latter require, the only work left to be done being the usual cooling and turning of the eggs.



Working Plan for wiring a 140-egg Incubator.

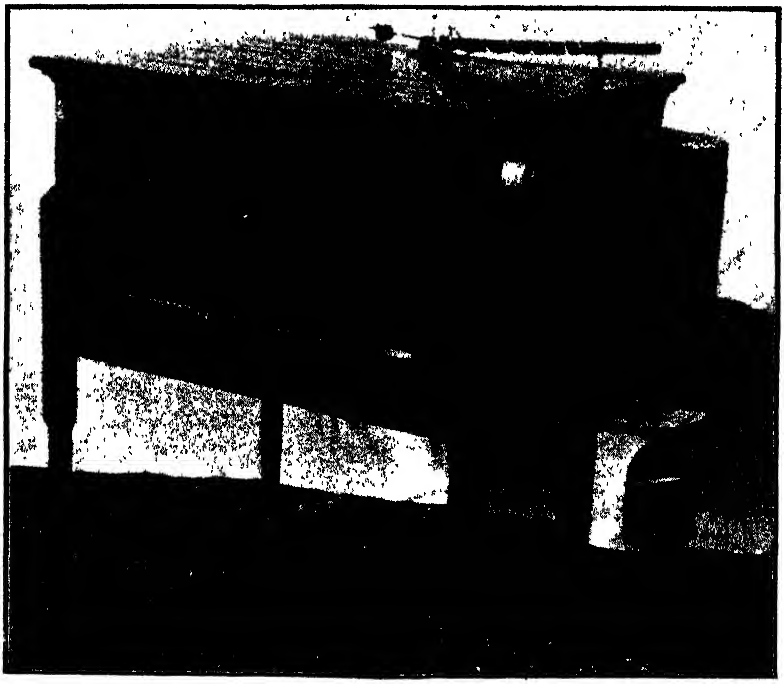
It has been claimed that chickens hatched by electricity have more stamina than others. We cannot substantiate this statement, our experience not showing any noticeable difference in development as compared with those hatched in other machines. The great drawback in the use of current is that it may be cut off at any time as the result of circumstances over which the operator has no control. To guard against this it is advisable to instal a lamp-heated system for use in emergency.

Hot-air incubators may be easily converted into the dual-purpose type (the lamp system being retained) by anyone possessing an ordinary amount of skill with tools, and without any great knowledge of electricity. The system in use at the College is simple, works most efficiently, and gives

good results. If the walls of the incubator are thoroughly insulated, and the use of the current is kept within the egg chamber, the cost of maintenance is low, being very little more than when heated with kerosene.

Approximately thirty units of current are required to run a 140-egg capacity machine for three weeks. Based on Sydney power rates of approximately 2d. per unit, the cost amounts to 5s. per hatch.

The special features of a machine of this type are the accuracy of the heating control, easy maintenance of a constant temperature, economical use of power, no objectionable smell (so that a machine can be installed in a private residence), a negligible risk of fire, and a considerable saving of



Kerosene-heated Incubator Adapted for Heating by Electricity.
Note the method of regulating the temperature.

labour. The accompanying plan indicates the method of wiring a 140-egg capacity Cypher machine, but by modifying the wiring and number of lamps, the method can be adapted to any other suitable machine, and will give equally good results.

The materials required are four carbon filament lamps, each of 32 candle-power, four battern holders, 5 yards of No. 1 x 18 (600 meg) wire, 2 feet of rubber-covered bell wire, one single-way porcelain connector, 1 yard of insulation tape, and a three-way ceiling rose.

The lamps are wired in series, "A" being paired with "B," and "C" with "D." At the point "E," the porcelain connector is used for making the joint with the bell wire before it emerges through the roof of the

machine, the No. 1 x 18 wire being too heavy for the lifting arm to make a sensitive contact with the mercury cup. The joint should be covered with the insulating tape.

The photograph shows the method of regulating the temperature, which is similar in action to when the damper is raised from the flue, the expansion and contraction of the thermostat raising and lowering the pin into the mercury cup.

The brass cup should be made from a $\frac{3}{4}$-inch piece of tubing, the hole being $\frac{1}{2}$ inch deep and $\frac{3}{8}$ inch in diameter; it should be three parts filled with mercury. The brass clips from the base of an old fuse make an excellent grip for the cup, to which they should be soldered.

The contact pin may be made from a brass cup hook that has been straightened. As mercury will sometimes cling to the point of a brass pin, a more satisfactory job will be made if, instead of using a brass-pin, the spare part in the specified ceiling rose is used, as only two parts are required to make the connection. This spare part should be screwed on to the arm and a small piece of carbon fitted into the slot for use as the pin.

When the wiring is completed it is advisable to cover the top just above the lamps with a piece of galvanised sheet iron; this will radiate the heat into the egg chamber and make a considerable saving of current. If at any time the current fails, all that is necessary is to hang on the damper, light the lamp, and adjust the regulator in the usual manner.

The Small Herd Pays.

In Which of the Following Classes is Your Herd ?

The Small Herd—

Well bred,
Properly fed and cared for;
Giving large yields and profits,

OR

The Large Herd—

Badly bred,
Improperly fed and neglected;
Giving small yields and losses.

The Department of Agriculture advises the farmer to keep fewer but better cows.

—*Farming in South Africa.*

Poultry Notes.

DECEMBER.

JAMES HADLINGTON, Poultry Expert.

THE year now closing constitutes one o' the most memorable in the history of specialised poultry-farming in this State, owing to the fact that the return per hen over cost of feeding has been the lowest for a period of twenty years, while it has been the year of greatest activity in the export of eggs.

With regard to the first item (the low return over cost of feeding) there has been both inquiry and criticism of the figures which the writer placed before the Poultry and Egg Committee of the Producers and Consumers' Conference at Bathurst in September last. The following summary will show the relative returns over cost of feeding, and incidentally also the cost of production, for the years ended 30th June, 1925, and 1926:—

Cost of egg production for the year 1924–5, on a farm of 800 layers producing 12 dozen eggs per hen per annum:

Land, cottage and poultry plant were set down as worth £1,500.

The prices of foodstuffs ruling in 1924–5 made the cost of feeding 9s. 11d. per hen for that year. The net return over cost of feed was 10s. per hen.

	£ s. d.	£ s. d.
800 hens at 10s.	....	400 0 0
Interest on £1,500 at 6½ per cent.	97 10 0	
5 per cent depreciation on plant (£500)	25 0 0	122 10 0
Net return for labour	....	£277 10 0

The average Sussex-street or mill prices of foodstuffs during that year were as follows:—Wheat, 6s. per bushel; maize, 5s. per bushel; pollard, 1s. 4d. per bushel; bran, 1s. 2d. per bushel.

On these figures the average cost to the farmer of producing eggs was 1s. 8d. per doz. After allowing for freight, commission and cartage, the average net price of eggs received by the farmer was 1s. 8d. per doz.

Taking next the year 1925–6, and adopting the same basis in respect of the farm, number of hens, and everything except feed (which was higher in price), we find the cost of production was 1s. 9d. per doz., while the net return to the farmer was 1s. 6d. This means that the return per hen was 3s. less than for the previous year, reducing the income by £120.

It should be remembered that the figures represent the position to 30th June of this year. But notwithstanding the fact that the cost of feeding is still high and probably will work out even higher for the period 1926–7 than for the previous year, it does not follow that our return over cost of feeding will be less, or even as low, for much depends in that relation upon the average price of eggs over the whole year. It has to be remembered that the spring

price for eggs this year has been 1d. to 2d. higher than for the corresponding period of last year. This should, according to all preceding experience, presage a much higher average price than for last year.

A Common Error.

It may be as well to point out an error into which many fall in computing the average price of eggs for any given year. The average is often obtained by adding up the prices quoted from month to month, and dividing by twelve, but a little reflection will show that the method is wrong. To get at the true average price received by the farmer, one must have regard to the quantity produced in each month or the average will be fictitious. The following table will make this clear.

Taking the 12-dozen average as a basis, with its probable incidence of laying for each month it will be found to work out as follows :—

July	10 eggs per hen	@ 2/- per doz., gives	1/8 per hen.
August	16 ,,	@ 1/4 ,,	1/9⅓ ,,
September	19 ,,	@ 1/4 ,,	2/1⅓ ,,
October	19 ,,	@ 1/4 ,,	2/1⅓ ,,
November	17 ,,	@ 1/5 ,,	2/0 1/12 ,,
December	16 ,,	@ 1/7 ,,	2/1⅓ ,,
January	13 ,,	@ 1/4 ,,	1/5⅓ ,,
February	11 ,,	@ 1/7 ,,	1/5 5/12 ,,
March	7 ,,	@ 2/3 ,,	1/3¾ ,,
April... ...	6 ,,	@ 2/8 ,,	1/4 ,,
May	4 ,,	@ 2/9 ,,	-/11 ,,
June	6 ,,	@ 2/6 ,,	1/3 ,,
		Total	19/6

The gross amount received per hen is thus shown to be 19s. 6d. Take again the same prices calculated on an equal number of eggs, but without regard to quantity produced each month, and the result would be as below :—

	Price for the month. s.	d.		Price for the month s.	d.
July	2	0	January	1	4
August	1	4	February	1	7
September	1	4	March	2	3
October	1	4	April	2	8
November	1	5	May	2	9
December	1	7	June	2	6
			Total	22	1

Comparing the two sets of figures, we find a difference between the calculations of 2s. 7d. per hen. This is where the critics erred in connection with average price of eggs as given by the writer at the Bathurst Conference.

Another alleged mistake lies in assessing the return to the poultry-farmer on the assumption of 800 hens and a farm value of £1,500. It has been said that farmers do not expect to make interest on the value of their farms. My reply to this was that the farmer who failed to take into account interest and depreciation on his farm could not be considered a business man. What about the farmer whose farm was mortgaged, or who had an overdraft on which he had to pay interest ? Such certainly could not escape calculating interest, seeing they had to pay it in hard cash. The farm must therefore

be expected to earn it. Not only so, but what kind of business would it be where a person invested £1,500 to enable himself to earn little if anything above the basic wage. If indeed these things were so, it would not be surprising to find people getting out of the industry. Happily we have hundreds of poultry-farmers who, taking the average of years and on a stock-taking basis business, are making both a living income and also interest and depreciation on the money invested. Otherwise the extension of farm equipment and increase of stock one sees from year to year on many farms could not go on. The beginner, however, should recognise that he cannot build up his farm and increase his stock and at the same time have the full benefit in cash.

The intense struggle that is being waged by many others in their endeavour to get a firm footing in the industry cannot, however, be overlooked, and to them years like the last one mean a near approach to bankruptcy. Unfortunately, the industry is one which most people enter with too little capital and mostly with less experience. Hence it is that the first blast of adversity in the way of high cost of feeding or low price of eggs brings many farms on to the market.

The heartening feature, however, is the many farms that have struggled through, some of them having been in existence ten, fifteen, twenty, and even thirty years. These are standing testimony to the fact that poultry-farming has, in the main, paid its way. One bad year does not constitute poultry-farming a failure, and it is safe to say that only a temporary check has been sustained in the past months, and that the industry as a whole will continue to expand. The writer is sufficiently optimistic to believe that just as the value and volume of the poultry industry has doubled itself during the last decade, so it will do again in the next like period.

The fact that we have a practically unlimited market open to us in Great Britain for our eggs, and that export of them has passed the experimental stage, opens up an avenue that was unexplored ten years ago. Faster ships, which are just now being talked of, are likely to add another two weeks to our export season, and instead of having to cold-sto e our surplus for two months or more, the period would then be reduced to six weeks What this would mean to the industry is known only to those with good inside acquaintance with the intricacies of the egg trade.

HORSES require anything from 5 to 15 gallons of water a day, the quantity depending on the temperature and the amount of work performed. The water should be as pure as possible, clear in appearance, and free from taste, colour, or smell. Pure water is just as essential to a horse as it is to a man, and it is a mistake to suppose that a horse can drink badly contaminated water with impunity.

Tubercle-free Herds.

The following herds of cattle have been submitted to the tuberculin test by Government Veterinary Officers or approved veterinary surgeons. All conditions required in connection with the test and with the scheme for certifying tubercle-free herds having been complied with, the herds are declared to be tubercle-free, and unless otherwise declared this certification remains in force until the date shown in respect of each herd:—

Owner.	Address.	Breed.	Number tested.	Expiry date of this certification.
Department of Education	Eastwood Home ...	......	10	20 Oct., 1927.
Do do ...	Hurlstone Agricultural High School.	......	47	5 Nov., 1927.
Do do ...	May Villa Homes ..	......	6	20 Oct., 1927.
Do do ...	Yanco Agricultural High School.	......	29	14 Jan., 1927.
Walter Burke	Bellefaire Stud Farm, Appin.	Jersey..	36	19 March, 1927.
Department of Education ...	Gosford Farm Home	......	32	16 April, 1927.
H. W. Burton Bradley ...	Sherwood Farm, Moorland.	Jersey..	71	21 May, 1927.
William Thompson Masonic Schools.	Baulkham Hills ..	.. ...	33	15 June, 1927.
Department of Education ..	Mittagong Farm Homes.	......	33	7 July, 1927.
Hygienic Dairy Company ...	Glenfield Farm, Casula, Liverpool.	. ....	113	15 Sept., 1927.
Lunacy Department ...	Morisset Mental Hospital.	.. ...	14	18 Oct., 1927.

—Max Henry, Chief Veterinary Surgeon.

Agricultural Societies' Shows.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 15th of the month previous to issue. Alterations of dates should be notified at once.

1927.

Society and Secretary.	Date	
Albion Park (H R Hobart) .	Jan.	1, 3
Dapto (E. G. Coghlan)	,,	14, 15
St. Ives (F. Conway)	,,	14, 15
Gosford (E. H. Fountain) ..	,,	21, 22
Kiama (G. A. Somerville) .	,,	25, 26
Wollongong (W J. Cochrane) ..	,,	27, 28, 29
Bellingen (F. Reynolds)	Feb.	3, 4, 5
Leeton (W. Roseworn)	,,	8, 9
Tahmoor (E. S. Key) .. .	,,	11, 12
Wyong (H. Brown)	,,	11, 12
Tilba (R. L. Hopgood) .. .	,,	11, 12
Newcastle (E J. Dann)	,,	15 to 19
Pambula (L. K Longhurst) .	,,	16, 17
Milton (F.W. Cork) .. .	,,	16, 17
Rydal (H. Murray)..	,,	18, 19
Castle Hill (H. A. Best) .. .	,,	18, 19
Dorrigo (J. H. Skeoch)	,,	23, 24
Alstonville (N. A. Ogilvie) ..	,,	23, 24
Oberon (F. B. Packer)	,,	24, 25
Gunning (G. E. Ardill)	,,	24, 25 26
Cessnock (D. B. McGilvray) ..	,,	24, 25, 26
Robertson (H. T. Carrick) ..	,,	25, 26
Blacktown (J. McMurtrie) ..	,,	25, 26
Bega ([illegible]	March	2, 3
Tumut ([illegible] ..	,,	2, 3
Braidwood (R. L. Irwin)	,,	2, 3
West Maitland (M. A. Brown) ..	,,	2 to 5
Adaminaby (P. L. Crisp) . ..	March	3, 4
Wauchope (T. Suters) . .	,,	3, 4
Moss Vale (W. Holt)	,,	3, 4, 5
Penrith (C. H. Fulton) .	,,	4, 5
Glen Innes (G. A. Priest).. .	,,	8, 9, 10
Bangalow (W. H. Reading) ..	,,	9, 10
Taree (R. Plummer) .. .	,,	9, 10, 11
Batlow (C. S. Gregory)	,,	15, 16
Cumnock (K. J. Abernethy) .	,,	16
Nimbin (S. H. Kilmister).. ..	,,	16, 17
Eden (H. P. Wellings) ..	,,	16, 17
Gundagai (N. W. Holman) ..	,,	16, 17
Mendooran (F. R. Mason) . ..	,,	18
Blayney (J. H. Moore)	,,	22, 25
Molong (W. P. Stanger) .. .	,,	22, 23
Kempsey (N. W Cameron) ..	,,	23, 24, 25
Campbelltown (W. N. Rudd) ..	,,	25, 26
Orange (G L. Williams)	,,	29, 30, 31
Camden (G. V. [illegible])	,,	31, Apl. 1, 2
Goulburn (F. D. Hay)	,,	31, Apl. 1, 2
Sydney Royal (G. C. Somerville)	April	11 to 20
Forster (W. Poppenhagen) ..	,,	29, 30
Grafton (L. C. Lawson)	May	4, 5, 6, 7
Windsor (H. S. Johnston) ..	,,	5, 6, 7
Dungog (W. H. Green)	,,	11, 12, 13
Wagga Wagga (F. H. Croaker) ..	Aug.	23, 24, 25
Ganmain (C. C. Henderson) ..	Sept.	13, 14

Orchard Notes.

December.

W. J. ALLEN and H. BROADFOOT.

THE second cover spray for codling moth, which will be applied during the month, will be the third application, including the calyx spray. It is necessary when spraying to see that the work is thoroughly done, and apple, pear, and quince trees should all be sprayed. The nozzle should be directed all over the trees, inside and out, and a strong effort should be made to place a coating of insecticide all over the fruit. Spraying that is performed carelessly is useless—a waste of time and money. In many cases the hoses attached to the spray outfit are not long enough, and when big trees are being treated it is impossible to get round in a thorough manner. To make matters worse, the horse very often does not stop exactly when and where required, and the work is made less effective, the operator not considering it worth while to go to the trouble of turning back into a more effective position, nor is it possible in many cases where the grade is steep to back the cart. To meet these contingencies a good length of hose is required, so that free movement may be made round each tree.

It is necessary to keep a stringent watch for all possible sources of infestation, such as returned cases. These cases provide a means of carrying grubs far and wide, and frequently a grower has only to pull a case to pieces to discover to what extent the grubs are being carried and distributed throughout the country. A grower is sometimes working energetically and effectively to keep orchard pests in check amongst his own trees, and at the same time is unwittingly introducing fresh infestations by means of second-hand cases. Any grower who makes use of second-hand cases should realise the risk involved, and so soon as such cases arrive at his orchard he should immerse each one in boiling water for three minutes. This will kill any grubs which may be harboured between the joints.

Many growers are realising the great benefits to be derived from the early hand picking of fruit infested with codling moth, and it is to be hoped that before long many other growers will follow along the same lines. There is no doubt that when this work is systematically carried out great numbers of grubs are destroyed and losses greatly minimised. As apple and pear crops are extremely light this season, growers have a splendid opportunity of carrying out the work more quickly and effectively than in a season of heavier crops. Any fallen fruit should be regularly picked up and destroyed by burning or boiling. The fruit must be destroyed while it is still infested; do not gather up the fruit and let it stand for some days before destroying it, for the grub then has a chance to escape.

Apple Leaf Jassid.

This pest attacks the leaves of apple trees, and by extracting the sap often causes the leaf to shrivel. This greatly handicaps the tree, particularly when it is carrying a heavy crop of fruit, and it also greatly interferes with regularity of cropping. It is essential to the well-being of the tree, to its development, and to its productivity, that its foliage should be kept in a healthy condition. The jassid is, therefore, inimical to the prosperity of the tree, and when it rests on the fruit it reduces its quality and value by marking it with the excrement. There is every indication of this pest being much in evidence this present year, and growers need to be seized with the importance of keeping it in check, for which purpose a nicotine extract will be found efficacious, especially if the trees have received an oil spray before the swelling of the buds in spring.

Pear and Cherry Slug.

This is a pest which, fortunately, is very easily controlled, but which if allowed to go unchecked will do a considerable amount of damage. The slug attacks the leaves of pear and cherry trees, and frequently prejudicially affects the current crop as well as the development of the tree and the following crop.

The leaves, whose function it is to elaborate raw food material into organised food material, play an indispensable part in the maintenance of the health and vigor of the tree, and if they are destroyed, the tree suffers severely. Spraying with lead arsenate will prove effective.

Fruit Fly.

Among the worst of the pests which should engage the unremitting vigilance of the grower is the fruit fly. In some districts this pest exacts heavy toll from the fruit crop. It is necessary, in order to secure satisfactory results, that all growers should recognise their common responsibilities by uniting in a sustained and thorough effort to keep this pest in check.

Fallen fruit should be picked up at short intervals and destroyed by boiling or by burning. Growers in districts free from fruit fly should, in their own interests, do all they can to keep their orchards free from the pest.

Cultivation.

To those growers who regard quality of fruit as of first-rate importance, good cultural work is paramount. Soil moisture must be conserved, and this can be accomplished by checking all weed growth and maintaining a gool soil mulch. To produce, carry, and to bring to maturity a good crop of fruit involves a severe strain upon a tree, and unless sufficient moisture is conserved for the needs of the tree the size and quality of the fruit must be adversely affected. Many growers run great risk in respect of cultural work, and at times as a result sustain heavy losses. A surface crust is allowed to form and weeds to grow, and thus by capillarity and by transpiration much avoidable loss of moisture is permitted. With the efficient modern implements now available large areas can be worked rapidly and effectively,

and in view of this fact it is simply appalling that so many growers neglect effective measures of reducing the loss of moisture to the lowest possible degree. The work must not be neglected or performed in a perfunctory manner. Good tilth is the sheet-anchor of successful farming, and the chief protection against dry spells and protracted drought.

Drains and Fences.

Surface drains should be kept clear, as heavy storms frequently occur during the summer months, and if adequate provision is not made for carrying off storm water, much soil will be washed away, and the grower will be put to the labour and expense of replacing it.

Keep an eye on fences in localities which are rabbit-infested. There is danger of considerable damage if these destructive animals gain access to the orchard. Preventive measures are the most profitable and effective.

Care of Young Trees.

Young deciduous trees, which were planted out during last winter in new areas, or as refills, should be kept well worked. Refills should receive special attention, for they are to a great extent handicapped by their proximity to established trees.

If the season is dry they should receive a copious watering, and a thick mulch of well rotted stable manure will prove beneficial. Any young trees which are developing strong shoots at the expense of others should be so treated by nipping back where necessary, to secure symmetrical development. Do not let young trees crop too soon. In many cases leaders which have not been headed back hard in the winter carry fruit on the extremities, and in such cases, especially when the leader is weak, a few apples will cause a limb to break or will weaken or retard the growth of the tree. Growers are advised to remove any fruit from such trees at a very early stage. This fruit, if allowed to mature, will prove a very poor compensation for retarded growth and weakened constitution.

In planting young trees it should always be borne in mind that the first few years of the life of a tree are of vast importance. Provided good trees are planted in good soil properly prepared and in a good locality, they will respond satisfactorily to good cultivation, manuring, pruning, and sanitation. Neglect spells disappointment and loss.

Marketing.

Growers have already commenced to pick stone fruit for market, and they will be well advised to pay strict attention to careful handling. Some growers go to great trouble to produce fine fruit, and then when it comes to marketing often do that part of the job quite carelessly. To secure the best results the fruit should be picked when firm but properly matured. It should be borne in mind that some time elapses between the picking of the fruit and its receipt by the consumer, and if it is over-ripe when it leaves the orchard there is little chance of its reaching the market in prime condition.

Bruised or over-ripe stone fruit cannot be sold at satisfactory prices. Care in handling is of great importance. The preservation of the skin in a sound, unbroken condition is absolutely essential if satisfactory results are to be obtained. In packing, see that the fruit is well graded for size and quality. To avoid bruising, do not finish the pack too high; but remember that loose packing is also detrimental to the fruit.

Drying Apricots.

To make a good dried article, the fruit should be allowed to remain on the tree until fully ripe, but not over-ripe. The method which is generally adopted in this State is to pick the fruit carefully into cases when it is fairly soft, as in that condition it makes the best dried article. This will probably necessitate going over the trees several times, as the fruit does not all ripen at the one time. As soon as possible, cart the cases to the cutting shed, where the fruit should be carefully and evenly cut in halves (not pulled apart) and the pits removed.

The fruit is placed on trays with the cup side up, and as soon as possible each tray is removed to the fumigator, where it can remain with the door closed until the fumigator is sufficiently full to start the sulphur burning. This is of great importance, as once the fruit has been cut it must not be exposed to sun or wind, or its appearance will suffer. When everything is ready, sulphur should be placed in the burner at the rate of approximately 1 lb. to every 200 cubic feet of room space. If possible, allow the fruit to remain in the sulphur room from eight to ten or twelve hours, or until the cup is full of juice. It can then be taken from the fumigator on the trays and placed on the drying ground. When the sun is the sole or main drying agent a drying ground must be provided, and to facilitate and provide for economic working the ground must be laid out in such a way that the fruit can be carried on trucks to any part of the ground. It is one of the essentials of the drying ground that it should be as free from dust as possible. When stone fruit is being dried it is better not to leave tracks or paths between the trays, but to cover the whole of the ground, so that there are only the outside trays to watch. The borders and any paths that are left should be kept well sprinkled with water.

Growers are advised to get the bulletin on "Fruit Drying," issued by this Department. The price is 10d., post free.

Thrips Infesting Strawberries.

Mr. O. Gates, a grower of a large area of strawberries at Narara, has been testing out several new varieties, and has found thrips to be abundant in all the flowers. Creswell and Malacoff have been a complete failure on account of the thrips, but two of the new varieties, Rhodes' Special and Feudalcino, have set and matured a fair crop, in spite of thrips.—W. B. Stokes, Orchard Inspector.

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